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FOOD AND AGRICULTURE ORGANIZATION
OF THE UNITED NATIONS

THE MYCOLOGICAL INSTITUTE
21 JAN. 1949

Unasylva

VOL. II NO. 5 SEPT.-OCT. 1948

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Unasylva *is prepared by the Division of Forestry and Forest Products and published by the Information Division of FAO at the Organization's temporary headquarters in Washington, D. C. It is printed in Baltimore, Maryland, U. S. A.* Unasylva *is published in English, French, and Spanish.* Unasylva *may be obtained from the following sales agents:* Australia: *H. A. Goddard Pty. Ltd., Sydney;* Canada: *The Ryerson Press, Toronto 2;* Czechoslovakia: *F. Topic, Prague 1;* Denmark: *Ejnar Munksgaard, Copenhagen;* Finland: *Akateeminen Kirjakauppa, Helsinki;* France: *Les Editions A. Pedone, Paris 5e;* Latin America: *International Documents Service, Columbia University Press, New York 27;* Netherlands: *N. V. Martinus Nijhoff, The Hague;* Switzerland: *Librarie Payot, S.A., Lausanne, and Hans Raunhardt, Zurich 1;* United Kingdom: *H. M. Stationery Office, London W.1;* United States: *International Documents Service, Columbia University Press, New York 27, and United Nations Bookstores, Lake Success, New York. Requests from countries where sales agents have not yet been appointed may be sent to: FAO Documents Sales Service, Food and Agriculture Organization of the United Nations, Washington 6, D. C., U. S. A.. Annual subscription, $3.50; single copy, 65 cents.*

Forest Conservation and Freedom from Want

DURING the last two or three years, the world's gravest economic problem has been that of food shortages. FAO, in consultation with its member governments and other international organizations, has consequently given special attention to solving this problem. The emphasis laid upon it may have suggested that the production and distribution of food are the sole field of FAO's activities. This is not so. The Constitution of FAO makes this clear. Its task is to raise the standards of living of the peoples of the world—in other words to provide them with "Freedom from Want."

"Freedom from Want" does not mean only "enough food for everybody"; it means sufficient food, clothing, and shelter to enable human beings to live happy, healthy, prosperous lives. That is why the nations of the world, in establishing FAO, placed forestry and forest products within its responsibilities. The successful prosecution of forestry and the proper use of forest products not only contribute largely to the homes and clothes the world needs, but also conditions in the long term the world's output of food.

N. E. Dodd

Director-General
Food and Agriculture Organization
of the United Nations

FAO accepted the Atlantic Charter declaration of "Freedom from Want" as its goal.

A rational, minimum definition of human wants includes the primary requisites of food, clothing, and shelter, satisfaction of which result from use of primary products of land. In any but the most primitive of societies it includes other things—security, health, education, amenities.

A broad definition of "want," going beyond "enough food," is built into FAO's structure and programs, which are designed to give its proper part and emphasis to each segment of conservation, so that the interrelationships may never be ignored.

As with "life, liberty, and the pursuit of happiness," so "satisfaction of human wants" is a readily acceptable philosophical objective. FAO, however, is judged, not by the nobility of its philosophical objectives, but by the realism and sanity of its practical programs to attain full, productive, and permanent use of land and water, and the welfare of the two billion people dependent upon them. The maximum that mankind can do positively and constructively is to produce full and sustained crops of food, fibers, and forests from the soils and waters of the globe.

The negative alternative is dependence, as the neo-Malthusians hint, on the classical Four Horsemen—War, Famine, Plague, and Death—in a descending spiral of self-extermination.

FAO's methods are twofold:

1. To stimulate and aid governments to act, knowledgeably and intelligently, in the self-interest of their

own people, as to primary production and distribution, through application of known techniques.

2. To help provide them with attainable and progressive targets of production toward which, by positive actions, they move, and by reaching which they may be judged.

Only as such targets are set can progress year by year be measured in true perspective against what could feasibly be done, and what needs to be done. Until such attainable goals are set, nation by nation, man cannot know whether his fate is perpetual want or whether by knowledge, intelligence, and hard work he can attain to an ordered abundance. It should be accepted that FAO set up attainable long-range production targets.

The realizable production of forests has been estimated. This serves to show the great unrealized potential, under present national inertias, of a major productive block of the earth's basic resources. Estimates of attainable production of the seas, croplands, and grasslands of earth, if only presently known technologies were applied, have not even been envisaged.

When nations deeply accept a goal—as in war—mechanisms for its full achievement are devised. The problem of nations and of FAO is to obtain the same moral content in the effort to satisfy human wants.

A broadened redefinition of objectives must emphasize

that satisfaction of basic wants from products of land and water is probably attainable under known technologies;

that this will require full and permanent use of land and water and their resources on a conservation rather than an exploitation basis;

that rational development in this direction requires knowledge of resources, separately and as a whole,
statement of attainable production goals,
government services to further development programs,
large capital investments, and
re-education of the primary producers to utilize known technologies of land use and crop production;

that national and commodity economics of scarcity are far more numerous than economics of surplus.

Thus, continuing attention to distribution, prices, and economic factors generally will be required.

But far greater attention is needed to building sustained production toward attainable levels of abundance, and to do so by maintaining the essential unity of all land and water conservation. The great difficulties and complexities are surmountable.

There are, then, several considerations that fortify such a broadened redefinition.

First of all, it is true, as the FAO Constitution implicitly assumes, that productive forest, range, and crop soils are still being destroyed by exploitative methods of use; that the application of known techniques could increase production and could replace exploitation with conservation. Meanwhile, and as a result, human want continues on a vast scale.

Second, FAO's Constitution declares its purpose to be

> raising levels of nutrition and standards of living of the peoples under their respective jurisdictions,
> securing improvements in the efficiency of the production and distribution of all food and agricultural products,
> bettering the condition of rural populations,
> and thus contributing toward an expanding world economy.

This means the satisfaction of human wants.

Agriculture is declared to include forests and forest products, fisheries and fisheries products. Thus the lands and waters of the globe and their primary organic products are the area of FAO work.

In stating that one function of the Organization is

> to promote the conservation of natural resources and the adoption of improved methods of agricultural production,

the Constitution recognizes the interrelationships of different kinds of land, the opportunities to get more useful products from them, the need to make their use permanent.

Third, the great unrealized potential of forest land, the great advances in production and distribution techniques applicable but not generally applied to food and fibers, suggest strongly but do not prove that man can lift himself from his present dilemma toward a more hopeful future.

This cannot be simple and easy. Indeed, where the imbalance between man and land is already severe, only prompt, stern conservation measures can hope to work toward a restoration of the balance. Elsewhere, only full development of unused resources, such as unexploited forests, can improve standards of living.

Finally, in a comprehensive and unified program of conservation, designed to replace scarcity with abundance, forestry and forest lands commonly occupy a key role. They may provide a continuing flow of products to satisfy human wants; and they may ensure the protection of soil, water flows, and local climate, without which food and agriculture in many lands will continue to deteriorate. They may, then, hold the whole task of conservation together.

Practical training in forestry is essential. This crew of men is carrying out an inventory in a Swedish forest.

A Survey of Employment and Education in Forestry

BY THE STAFF OF THE DIVISION OF FORESTRY AND FOREST PRODUCTS

THE remedy for the world-wide forest products deficit lies in better national policies; carrying out these policies requires adequate personnel.

A few months after it was established, the Forestry and Forest Products Division of FAO undertook a questionnaire survey on the status of employment in forestry, its development as contemplated by various countries, and the resources of those countries for training personnel.

Although some valuable results were obtained, the first experimental survey demonstrated the difficulties involved in a project of this kind. The survey covered 65 countries. From those countries which administer territories outside the mother country, individual replies were requested for each of the territories, or at least for all of them taken together. About 50 replies have been received. In addition, in the case of some territories under British administration, a number of tables could be completed with data obtained from the *Empire Forestry Handbook*. However, all the information collected covers only 66 percent of the productive forest land of the world. This low figure is due primarily to the fact that the U.S.S.R. has not replied to the questionnaire, and the forest land of that country alone is more than 25 percent of the world total.

The data received are presented in tabular form below, with some discussion of each table. In these tables the various countries have been grouped so as to bring out particularly significant data.

Tables 1 (A) and 1 (B)

Table 1 (A) shows in detail the reported numbers of personnel now employed in forestry management work, including both the personnel with advanced technical training and those with subprofessional training.

It is obvious that only a comparison between the number of foresters and the area of *productive* forests is of real interest. However, in such a comparison, it must be remembered that, for the whole world, 46 percent of the total area of productive forests is still considered inaccessible. Nevertheless, even in inaccessible forests, which are reserves for the future, at the least some form of protection against fire should be established, even though it may be lacking now.

Hence, if we take the total of productive forests into consideration, as is done in Table 1 (A), it appears that on a world-wide scale there is one forestry technician per 104,000 hectares of forest land, and one subordinate forestry employee per 32,000 hectares, whereas Denmark has one forestry technician per 1,700 hectares and one subordinate employee per 900 hectares.

The underdevelopment of the countries of the Southern Hemisphere in this field, with the exception of the Pacific area, is striking. It is brought into relief in the first four columns of Table 1 (B). Europe and North America together have 82 percent and 84 percent respectively of the technicians and subordinate forestry employees of the reporting countries.

In column 5 of Table 1 (B), there is striking variation in the proportions between the numbers of subordinate employees and the numbers of persons employed in a technical capacity; this discrepancy is even more strongly marked in government services. In Europe, the northern countries have, in government services alone, an average of 2 subordinate employees to each technical officer, and the proportion is the same in North America. For other European countries, there are 6 subordinate employees to each technical officer. Asia, particularly because of the organization of the Indian Forest Service, and North Africa and the Middle East, also have a comparatively high proportion of the one to the other. These proportions appear to be in direct relation to the density of population and no doubt also to the attitude of the inhabitants toward the forests. The countries whose forests are relatively scarce and comparatively easy of access feel the need of stricter supervision of their forest stands.

The last three columns of Table 1 (B) also furnish certain information on this subject, but hasty conclusions should be avoided. Densely populated countries are generally poor in forests, or else the forests are beyond the reach of the centers of population, so that no very definite relation between the number of inhabitants and the number of forestry officials can be expected. Nevertheless, these columns are indicative of the interest shown by various regions in the conservation and management of their forests. This interest is particularly marked in the Northern Hemisphere, but there are comparable figures for the Pacific region which clearly indicate developing attention to forestry in that area.

Finally, considering Europe alone in Table 1 (A), it may be seen that privately owned forests are somewhat more neglected than public lands. Still, one question in the survey seems to have been sometimes misunderstood: some European countries probably have included timber industries technicians whereas

TABLE 1 (A).—PROFESSIONAL FORESTERS EMPLOYED (NOT INCLUDING INSTRUCTORS)

	Government services		Private industries and organizations		Total		Area of productive forests (*Millions of hectares*)	Areas per forester (*Thousands of hectares*)	
	E.[1]	S.[2]	E.[1]	S.[2]	E.[1]	S.[2]		E.[1]	S.[2]
I. EUROPE									
1) Northern Europe									
Iceland	2	4	—	—	2	4	—	—	—
Finland	516	310	372	2,320	888	2,630	20.7	23	8
Sweden	455	1,790	540	1,450	995	3,240	22.9	23	7
Norway	235	250	320	1,600	555	1,850	6.1	11	3
Denmark	67	151	155	278	222	429	0.4	1.8	0.9
Total for Northern Europe and averages	1,275	2,505	1,387	5,648	2,662	8,153	50.1	22	6.1
2) Central and Southern Europe									
United Kingdom	166	524	—	—	166	524	1.3	7.7	2.4
Netherlands	41	81	16	100	57	181	0.2	4.4	1.4
Belgium	99	832	—	—	99	823	0.5	5.5	0.6
Luxembourg	9	53	—	25	9	78	0.1	8.7	1
France	536	4,979	250	—	786	4,979	10	13	2
Switzerland	266	1,638	10	1	276	1,639	0.8	2.9	0.5
Czechoslovakia	626	2,654	320	2,279	946	4,933	4	4.2	0.8
Austria	244	695	171	1,908	415	2,603	2.8	6.7	1.1
Italy	400	4,860	20	40	420	4,900	5.0	12	1
Bulgaria	609	2,312	30	18	639	2,330	3.1	4.9	1.3
Greece	176	546	10	—	186	546	0.6	3.2	1.1
Total for Central and Southern Europe	3,172	19,174	827	4,371	3,222	23,545	28.4	7.1	1.2
TOTAL FOR EUROPE	4,447	21,679	2,214	10,019	6,661	31,698	78.5	9.1 77.8	1.8 2.4
II. NORTH AMERICA									
Canada	322	763	248	1,073	570	1,836	211	370	115
United States	4,295	8,517	2,000	3,968	6,295	12,485	192	31	15
Newfoundland	0	0	0	0	0	0	3.8	—	—
Total of North America and averages	4,617	9,280	2,248	5,041	6,865	14,321	406.8	59	28
III. ASIA (excluding the Near East and Middle East)									
China	420	700	466	150	886	850	56	63	66
India (excluding British India)	545	4,960	—	—	545	4,960	33	61	7
Indonesia	99	137	—	—	99	137	120	1,212	876
Territories under French administration	15	—	—	—	15	—	25	1,667	—
Philippine Republic	108	378	30	53	138	431	16	115	37
Territories under British administration	43	—	—	—	43	—	17	395	—
Siam	177	—	34	—	211	—	12	68	—
Total for Asia and averages	1,407	6,175	530	203	1,937	6,378	279	144	44
IV. AFRICA (excluding North Africa)									
Belgian Congo	11	19	10	—	21	19	1,192	5,667	6,263
Union of South Africa	64	190	15	44	79	234	0.8	10	3.4
Territories under British administration	136	62	—	—	136	62	58	426	935
Territories under French administration	95	180	10	—	105	180	118	1,124	655
Total for Africa and averages	306	451	35	44	341	495	295.8	867	597

TABLE 1 (A).—PROFESSIONAL FORESTERS EMPLOYED (NOT INCLUDING INSTRUCTORS)—*Concluded*

	Government Services		Private industries and organizations		Total		Area of productive forests (*Millions of hectares*)	Areas per forester (*Thousands of hectares*)	
	E.[1]	S.[2]	E.[1]	S.[2]	E.[1]	S.[2]		E.[1]	S.[2]
V. NORTH AFRICA AND MIDDLE EAST									
Iran	35	115	—	—	35	115	4	114	35
Iraq	1	17	—	—	1	17	1	1,000	59
Syria	2	115	—	—	2	115	0.1	50	0.9
Algeria	46	350	—	—	46	350	2.6	57	7.4
Tunisia	5	85	1	1	6	86	0.6	100	7
Morocco	6,667	21,679	—	—	34	356	2.5	73	7
Territory under British administration	37	30	—	—	37	30	3.6	97	120
Egypt	0	0	0	0	0	0	—	—	—
Total and averages	160	1,068	1	1	161	1,069	14.4	89	14
VI. PACIFIC AREA									
Australia	216	268	9	5	225	273	20	89	73
New Zealand	36	134	3	12	39	146	2	51	14
Total and averages	252	402	12	17	264	419	22	83	53
VII. LATIN AMERICA									
Mexico	130	180	—	—	130	180	35	269	194
Guatemala	15	129	—	—	15	129	5	333	40
Nicaragua	9	—	—	—	9	—	7	778	—
Cuba	28	—	—	—	28	—	1.5	54	—
Haiti	—	30	—	—	—	30	1	—	33
Puerto Rico	5	6	—	—	5	6	0.1	20	17
Territories under British administration	19	66	—	—	19	66	15.8	832	239
Colombia	—	14	—	—	—	14	60	—	4,286
Ecuador	18	—	—	—	18	—	20	1,111	—
Peru	5	2	2	—	7	2	50	7,143	25,000
Brazil	22	—	2	—	24	—	377	15,708	—
Argentina	55	—	10	—	65	—	40	615	—
Chile	9	—	4	20	13	20	13	1,000	650
Total for Latin America	315	427	18	20	333	447	625.4	1,878	1,398
WORLD TOTAL	11,504	39,482	5,058	15,345	16,562	56,827	1,721.9	104	32

[1]Advanced technical training.
[2]Subprofessional training.

TABLE 1 (B).—NUMBER AND PROPORTION OF SUBPROFESSIONAL FORESTRY EMPLOYEES TO PROFESSIONAL FORESTERS PER REGION FOR ALL THE COUNTRIES LISTED IN TABLE 1 (A)

Regions	Total		Relative proportion		Proportion S.[2]/E.[1]	Number of inhabitants (in millions)	Proportion N./E.	Proportion N./S.
	E.[1]	S.[2]	E.[1]	S.[2]		N.		
Europe	6,661	31,698	40.5	58.0	4.8	205.2	30,800	6,500
North America	6,865	14,321	41.5	26.0	2.1	143.8	20,900	10,000
Asia	1,937	6,378	11.5	11.5	3.3	884.8	456,800	138,700
Africa	341	495	2.0	1.0	1.5	95.9	281,200	193,700
North Africa and Middle East	161	1,069	1.0	2.0	6.6	64.2	398,700	60,000
Pacific Area	264	419	1.5	0.5	1.6	8.6	32,600	20,500
Latin America	333	447	2.0	1.0	1.3	113.2	339,900	253,200
Total and averages	16,562	54,827	100.0	100.0	3.3	1,515.7	91,500	27,600

[1]Advanced technical training.
[2]Subprofessional training.

the words "foresters employed in industries," used in the questionnaire, were intended to apply to technical and subprofessional personnel employed by industrial owners of forest lands or to those with cutting licenses, in order to assure good management of their forests.

In any case, only the North European countries have more forest technicians and many more subprofessional assistants employed in private forests than in public forests. However, the area of private forests is 72 percent of the total productive area, so that private forests have only one technician for 26,000 hectares and one subprofessional for 6,000 hectares, while in public forests there is one technician for 11,000 hectares and one subprofessional for 5,600 hectares. But this disequilibrium between private and public forests is much more important for the other reporting European countries. There, private forests cover 60 percent of the total productive area, and if private forests have one technician for 11,000 hectares and one subprofessional for 3,600 hectares, public forests would have one technician for 3,300 hectares and one subprofessional for 550 hectares. Obviously, in many European countries, governmental services have some supervision over private forests. However, it remains true that these figures signify a considerable relative backwardness in the development of privately owned forests though, from this point of view, important progress is noted in Scandinavian countries.

TABLE 2 (A).—TRENDS FOR THE FUTURE

Increases considered necessary for 1948 (professional foresters of government services only)

Regions	Present number	Increases provided for	Rate of increase in relation to the present figure *Percent*
Europe	4,447	845	19
North America	4,617	699	15
Asia	1,407	176	12
Africa	306	58	19
North Africa and the Middle East	160	140	87
Pacific Area	252	87	35
Latin America	315	155	49
Total	11,504	2,160	19

In North America, Canada has a relatively small proportion of private forest lands (12 percent). On the contrary, in the United States, it is 72 percent and, even so, while public forests have one technician for 12,000 hectares and one subprofessional for 6,000 hectares, private forests have only one technician for 70,000 hectares and one subprofessional for 35,000 hectares. Consequently, relative backwardness is much more important here than in Europe.

TABLES 2 (A) AND 2 (B)

Questions regarding the increase in the number of foresters were raised to ascertain the forest policy trends in various countries. Although there were widely divergent interpretations of these questions, it is possible to form an idea of these tendencies for the major regions of the world from these tables, in which all countries appearing in Table 1 (A) are included.

All these countries seem to be anxious to develop or to organize their present forestry services. This observation remains valid even in the countries poorest in forest resources, for example, those of the Middle East. Of course, circumstances may arise which prevent countries from bringing their plans to fruition. Nevertheless, under the most favorable circumstances, there will be in 1950 approximately one forestry officer on the average for every 78,000 hectares of productive forests.

Progress on privately owned forest land will probably be slower than in the government services. However, in many regions, the planned rate of increase in employment is similar.

TABLES 3 (A) AND 3 (B)

The purpose of the question was to determine, for each country, the number of foresters considered necessary to administer all of its forests in accordance with forestry principles.

This question was interpreted in various ways. Perhaps it should have been specified whether it applied only to productive forests or only to accessible productive forests. Probably lack of precision in the question is responsible for the wide differences shown in Table 3 (A) regarding the areas a forester can handle under regular management—from 7,000 hec-

TABLE 2 (B).—TRENDS FOR THE FUTURE

Estimate of the number of professional foresters necessary for 1950

Regions (1)	Government Services: Present (2)	Government Services: 1950 (3)	Government Services: Increase (4)	Government Services: Rate of increase (5)	Private Forest Land: Present (6)	Private Forest Land: 1950 (7)	Private Forest Land: Increase (8)	Private Forest Land: Rate of increase (9)	Total: Present (2+6)	Total: 1950 (3+7)	Total: Increase (4+8)	Total: Rate of Increase (13)
				(*Percent*)				(*Percent*)				(*Percent*)
Europe	4,447	5,692	1,245	28	2,214	2,900	686	31	6,661	8,592	1,931	29
North America	4,617	6,185	1,568	34	2,248	2,785	537	24	6,865	8,970	2,105	31
Asia	1,407	1,910	503	36	530	775	245	46	1,937	2,685	748	39
Africa	306	403	97	32	35	43	8	23	341	446	105	31
North Africa and the Middle East	106	388	228	142	1	1	0	—	161	389	228	142
Pacific Area	252	412	160	63	12	15	3	25	264	427	163	62
Latin America	315	588	273	87	18	98	80	444	333	686	353	106
Totals and averages	11,504	15,578	4,074	35	5,058	6,617	1,559	31	16,562	22,195	5,633	34

TABLE 3 (A).—ESTIMATE OF THE NUMBER OF PROFESSIONAL FORESTERS NECESSARY FOR TOTAL MANAGEMENT OF FORESTS

Regions	Area of productive forests	Present number of professional foresters			Number considered necessary			Increase considered necessary			Number of hectares per professional forester
	(*Thousands of ha*)	*Govt.*	*Private*	*Total*	*Govt.*	*Private*	*Total*	*Govt.*	*Private*	*Total*	*Thousands of ha*
Europe	78.5	4,447	2,214	6,661	7,544	3,665	11,209	3,097	1,451	4,548	7.0
North America	406.8	4,617	2,248	6,865	6,515	3,010	9,525	1,898	762	2,660	42.7
Asia	279.0	1,407	530	1,937	2,463	938	3,401	1,056	408	1,464	82.0
Africa	295.8	306	35	341	413	46	459	107	11	118	644.0
North Africa and the Middle East	14.4	160	1	161	419	1	420	259	0	259	34.3
Pacific Area	22.0	252	12	264	628	33	661	376	21	397	33.3
Latin America	625.4	315	18	333	929	409	1,338	614	391	1,005	467.4
Total and averages	1,721.9	11,504	5,058	16,562	18,911	8,102	27,013	7,407	3,044	10,451	63.7
						Rates (*percent*)		64	60	63	

TABLE 3 (B).—ESTIMATE OF THE NUMBER OF FORESTERS NECESSARY TO ENSURE REGULAR MANAGEMENT OF ALL FOREST LAND

—Selected countries—

Country	Area of productive woodland	Government services		Private forests		Total	Total	Number of hectares per forester	
	(*Thousands of ha*)	E.[1]	S.[2]	E.[1]	S.[2]	E.[1]	S.[2]	(*Thousands of ha*) E.[1]	S.[2]
Denmark	391	70	155	160	300	230	455	1.7	0.9
Sweden	22,000	475	1,900	550	1,490	1,025	3,390	21.4	6.5
Switzerland	800	300	1,700	15	4	315	1,704	2.5	0.5
United States (including Alaska)	191,700	5,655	11,285	2,370	4,729	8,025	16,014	23.9	12.0
India	33,295	900	9,000			900	9,000	37.0	3.7
Australia	20,250	518	561	21	10	539	571	37.5	35.4

[1]Advanced technical training.
[2]Subprofessional training.

tares for Europe to 467,000 hectares for Latin America and 644,000 hectares for Africa.

Nevertheless, the differences are still striking when the reporting countries are restricted, as in Table 3 (B), to some of those where difficulties could scarcely be found in the definition of the areas involved, and where a high standard of forestry methods has already been reached. While Denmark considers that one forester is needed for 1,700 hectares (about the same as it has now), Sweden considers one for 21,400 hectares sufficient, the United States one for 23,900 hectares, and Australia one for 37,500 hectares.

It would be impossible, of course, for the United States, as an instance, to contemplate a basis similar to Denmark, since that would involve a technical staff of 112,000 foresters, while the present number is only 6,295. Hence, it must be recognized that the kind of management a country can aim for is conditioned not only by the perfection it has reached in silvicultural techniques, but also by its general economic conditions, involving such factors as the development of roads and means of transportation, the density of population, and the expansion of markets.

However, it is too easy to say that everything depends on "intensity of management." What, exactly, does this mean? Would the perfection be relative to management, and also, consequently, to silvicultural care? Are proper management and silvicultural care merely relative ideas? If "very intensive" management is necessary to obtain from the forests their maximum yield, must the countries owning large forest areas be content to resign themselves to obtaining smaller yields per hectare? Or are there radically different conceptions of management?

At least, this part of the questionnaire draws attention to the problem, the importance of which is obvious to any forester.

TABLES 4 (A) AND 4 (B)

In many cases, questions relating to the number of foresters serving as instructors seem to have been misinterpreted. The purpose of the questionnaire was to determine the number of specialized teachers now teaching in forestry schools. Some European countries reported very low figures which obviously do not correspond to reality.

The number of engineers or officers who were graduated with degrees in 1946 fell off considerably, as compared to the average for the years 1935-1939. This decline was due primarily to the decrease in the number of such graduates in North America, and the cause was obviously the disruption of school curricula and attendance caused by the war.

On the other hand, the anticipated number for 1950 will be more than 2½ times greater than the average for 1935-1939 and over 3½ times that of 1946.

In Table 4 (B), an effort was made to find out whether these expected increases would provide the number of foresters estimated to be needed. If

TABLE 4 (A).—TEACHING STAFF AND GRADUATIONS

	Number of teachers		Number of engineers or foresters receiving degrees per annum			Number of students graduated per professor	
	Present	Estimated for 1950	Average for 1935-1939	1946	Estimated for 1950	1946	Estimated 1950
Europe	217	230	335	454	749	2.1	3.3
North America	286	612	923	322	2,042	1.1	3.3
Asia	303	480	89	129	543	0.4	1.1
Africa	9	19	15	23	30	2.6	1.6
North Africa and Middle East	0	12	3	1	152	—	12.7
Pacific Area	9	18	10	16	65	1.8	3.6
Latin America	16	44	29	43	45	2.7	1.0
Total and Averages	840	1,415	1,404	988	3,626	1.2	2.6

TABLE 4 (B).—EXPECTED GRADUATIONS IN RELATION TO ESTIMATED NEEDS

Regions	Present number of professional foresters	Losses over a three-year period estimated at 9%	Remainder (1 -2)	Number considered necessary in 1950	Number of graduates			Number of new graduates in 3 years	Increase considered necessary (4—3)
					1946	1950	Annual average 1946-1950		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Europe	6,661	600	6,061	8,592	454	749	602	1,806	2,531
North America	6,865	618	6,247	8,970	322	2,042	1,182	3,546	2,723
Asia	1,937	174	1,763	2,685	129	543	336	1,008	922
Africa	341	31	310	446	23	30	27	81	136
North Africa and Middle East	161	14	147	389	1	152	76	228	242
Pacific Area	264	24	240	427	16	65	40	120	187
Latin America	333	30	303	686	43	45	44	132	383
Total	16,562	1,491	15,071	22,195	988	3,626	2,307	6,921	7,124

planned increases are carried out, the total number of forestry officers would be augmented from 16,562 to 22,195 within three years. It might be estimated roughly that the losses due to the retirement or decease of foresters in three years would amount to 9 percent of present staffs, or 16,652. Therefore, the number of foresters to be graduated from the schools would have to make good a deficit of 22,195—16,652 (1 — 0.09) = 7,124. Given the fact that, over those three years, the average yearly number of foresters to be graduated will be equal to the average number for 1946 and 1950, the figure will equal

$$3 \times \frac{988 + 3{,}626}{2} = 6{,}921$$

which is fairly close to the anticipated need.

Although this check, approximate though it be, is sufficiently satisfactory for the world as a whole, Table 4 (B) makes it clear that no such balance can be anticipated for all parts of the world. In particular, the educational policy followed by certain countries of Europe is clearly inadequate to provide for the increase in the number of foresters required in 1950.

Table 4 (A) shows that the increase anticipated for 1950 in the number of teachers does not correspond exactly to the increase in the number of persons taking degrees. These increases are not necessarily proportional, of course. But it is striking that North America, where the number of students taking degrees in 1950 will be more than twice the average of the years 1935-1939, is more than doubling the number of its teachers. On the contrary, for the entire world there will only be a 69 percent increase in the number of teachers as compared to an anticipated increase of 158 percent in the number of students taking degrees during the same period. It is true, however, as shown in the last two columns of Table 4 (A), that the proportion of the number of students taking degrees to the number of teachers was widely divergent among the various regions in 1946, and this proportion would therefore be reduced to more closely comparable figures for 1950.

In a general way, the number of graduates per teacher seems very low.

Finally, many countries have no forestry schools of their own and must depend on the courses their students take abroad in order to increase the number of their foresters.

TABLES 5 (A) AND 5 (B)

These tables show that many countries wish to send students abroad, either to acquire degrees or to take advanced courses.

The opportunities in this field are, generally speaking, entirely inadequate to the demand, which leads to the conclusion that countries without forestry schools should organize some as soon as possible, in order to guarantee the development of their forestry services.

However, there are some opportunities open and it is probable that full advantage is not being taken of them.

Among the countries accepting foreign students, however, only the United States has indicated that a certain number of scholarships are offered by various government and private organizations. For countries wishing both to accept foreign students and to send some of their own abroad, a system of reciprocal exchange could be organized.

TABLE 5 (A).—COUNTRIES WILLING TO ADMIT STUDENTS FOR TRAINING (ADVANCED COURSES)

	Number of Students per annum
Europe	
Bulgaria	3
Finland	5
France	30
Greece	5
Italy	3
Sweden	5
Switzerland	10
Czechslovakia	25
North America	
Canada	45
United States	106
Asia	
The Philippines	3
Africa	
France (for its African territories)	6
Pacific Area	
Australia	2
New Zealand	2 (after 1950)
South America	
Brazil	3
Total	253

OTHER QUESTIONNAIRE RESULTS

The other questions asked generally received very vague and incomplete replies, if any at all. A few points which may be of interest are mentioned.

Only 5 European countries, together with the United States and Australia, stated that they were prepared to send teachers and professional foresters on missions abroad. The United States did not specify the exact number of the latter; for Europe and Australia, the figures are:

Bulgaria	2	professional	foresters	(and) 2	assistants
Denmark	12	"	"		
Finland	50	"	"		
France (including its African territories)	15	"	"	25	"
Italy	6	"	"	10	"
Sweden	5	"	"		
Australia	1	"	"	1	"

As regards the number of teachers and foreign foresters requested for each country, there were only a few replies of interest:

Argentina requests			50	professional	foresters	& 100	assistants
Iran	"	5 teachers,	18	"	"	" 20	"
Chile	"	3 "	6	"	"	" 20	"
Sweden	"		5	"	"		
Iraq	"	1 "	3	"	"		
Peru	"		2	"	"		
France	"		1	"	"		

The Philippines and New Zealand have a limited number of professional foresters, but gave no exact figures.

TABLE 5 (B).—COUNTRIES DESIRING TO SEND STUDENTS ABROAD

	For advanced degrees from 1948 to 1950	For refresher courses or advanced training without degrees
Europe		
Austria	3 per annum	
Finland	2 per annum	
France		3 per annum
Greece	5 per annum	5 per annum
Italy	2 per annum	3 per annum
Luxembourg	4 in 1949	
Netherlands	10 per annum	
Poland	7 in '48; 9 in '49 and '50	38 in '48; 35 in '49 and '50
Czechslovakia		30 per annum
North America		
Canada	15 per annum	5 per annum
United States	128 per annum	
Asia		
China	14 per annum	16 per annum
India	17 per annum	
Indonesia	10 per annum	
The Philippines	4 per annum	4 per annum
Siam	2 per annum	2 per annum
Africa		
Union of South Africa	2 in 1950	2 in 1950
North Africa and the Middle East		
Iran	30 per annum	
Iraq	2 per annum	7 per annum
Morocco	2 per annum	1 per annum
Syria	1 per annum	1 per annum
Pacific Area		
Australia	3 in '48-'49; 2 in '50	4 per annum
New Zealand	1 in 1950	4 per annum
Central and South America		
Argentina	3 in '48-'49; 2 in '50	7 in '48; 6 in '49 and '50
Brazil	10 in '48-'49; 4 in '50	
Chile	2 in '49 and '50	4 in 1950
Cuba	1 per annum	2 per annum
Peru	3 per annum	
Puerto Rico	1 in '48; 2 in '49 and '50	
Approximate Totals	274	131

A heavy stand of second-growth Douglas fir on the Clemons Tree Farm, state of Washington, where the tree-farm idea originated. A tree-farm employee, with a hose-equipped fire truck, stands on an old logging railroad grade which has been converted into a forest road.

The American Tree-Farm Movement

By CHARLES A. GILLETT

NOW, perhaps more than ever before in the world's history, nations are taking stock of their natural resources. This is especially true in the United States. With the world's costliest war behind it and the country already committed to a long-range program of world rehabilitation, it is time that Americans looked at their natural resources with an eye to the future.

Fortunately, wood is the one great natural resource that replaces itself. Land that produces timber will grow more timber. The process has been going on since the beginning of time but, all too frequently, it has had too little co-operation from man.

Realization of this fact germinated the American tree-farm system, which has become a potent factor in forest thinking in this country.

On the Pacific coast of Washington state is Grays Harbor county, in the heart of the Douglas fir region. There, about 1940, the Weyerhaeuser Timber Company undertook an intensive program of reforestation on cutover lands, some of which had been logged in the 1890s. This area, something over 100,000 acres (40,000 ha), was in varying stages of new growth. Much of it contained vigorous stands of second growth; much was still denuded as result of heavy logging followed by forest fires.

The project involved an intensive fire-control system, a planting schedule, and intensive management of the whole area. Fire towers were erected. Old railway logging grades were put into shape for trucks. More roads and trails were built. Telephone and radio communication was developed. Specially designed pumper trucks and other fire fighting equipment were built. Water sources were developed. The initial outlay included, among other things, construction of 170 miles (270 km) of roadway, stringing of 90 miles (140 km) of telephone lines, and the erection of four lookout towers.

Fire Control

The financial success of this long-range investment was threatened by one primary risk—forest fire. The company had estimated that fire losses could not exceed more than one quarter of 1 percent a year, over the growing-harvesting cycle. This was a low loss-factor for the area, and control of fire depended upon more than the fire control system. It depended upon the attitude of the area's neighbors.

These neighbors were various. For years, fishermen, hunters, picnickers, berry pickers, and others had roamed the area. Too often, they regarded logged-off land as valueless, and new forest growth as too worthless to consider. So, too often, carelessness resulted in fire. Other neighbors included ranchers, some living within the area, who habitually thought of timber in terms of virgin trees, and not in terms of second growth.

Here was a problem in human relations. It was a problem of explaining, in a practical way, what a reforestation project of this type meant to the whole community in terms of future employment, industrial development, and recreation.

Then it was that the term "tree farm" was coined. Such expressions as "reforestation project" were dropped, and the area was named the Clemons Tree Farm, honoring a pioneer logger of the region. When the governor of the state, with other officials, dedicated it formally, it become America's first tree farm.

Not that growing trees according to a management plan was new. But the name, and the program of publicity which promoted it, were new. The idea caught on quickly. The idea of purposeful growing of trees as an agricultural crop had public appeal. Hundreds of people visited the Clemons Tree Farm the first season, with a constant stream of more visitors since. It became a local attraction. Callers came and went away impressed with the fact that timber really is a crop. In a country accustomed to migrating forest industries, the Clemons Tree Farm was new, for it meant permanence.

The Washington state tree farm development soon attracted national interest and in March 1942 the executive committee of the National Lumber Manufacturer's Association approved a plan for conducting a national movement under the title "American Tree Farms." The movement is now directed by the American Forest Products Industries, Inc., with headquarters in Washington, D. C. This organization, dedicated to the protection of timber resources in the United States and to encouragement of good forest practices, maintains national records and assists and advises state groups in the initiation of local tree-farm programs.

The movement spread rapidly. Arkansas and Alabama had their first tree farms certified and operating in the spring of 1942.

Some of the mobile fire-fighting equipment developed for the Clemons Tree Farm, state of Washington. Here, at headquarters, fire warnings are received by telephone and radio, and fire fighters are dispatched with the speed of a city fire department.

From that beginning the American Tree Farm system has spread to 19 of the 48 states. The nearly 1,400 affiliated farms have an area of more than 15 million acres (6 million ha). The acreage has increased at a rate of about two million acres (800,000 ha) a year. The Northwest Loggers Association directs the program in the Douglas fir region of western Washington and Oregon. In the South, the Southern Pine Association promotes the idea, but the sponsorship is by states or organizations within states. The Western Pine Association has assumed leadership in its region. Sponsorship elsewhere is usually by state agencies or state forestry associations.

Tree Farm Defined

What is the tree-farm movement? What does it do? Is it a plan for instruction in forest management? Or is it a promotional project? Is it advertising?

It partakes of a little of all these, yet it is primarily not one of them. Perhaps a definition and a brief description of its functioning will clarify its purposes.

A tree farm is generally defined as "an area of privately owned forestland dedicated to the growing of forest crops for commercial purposes, protected and managed for continuous production of forest products."

It is chiefly a form of recognition of a good job of woodland management. First, local standards, suited to local conditions, are adopted. These usually take into consideration both the owner's intent and his performance. Is he managing his woodland for future and continuous crops of trees? Is he protecting his tree acres from fire and overgrazing, from insects and disease? Are his cutting practices satisfactory?

When, after investigation, the answers to these and similar questions are affirmative, a local forest-practice committee, set up by the sponsors, then certifies the area as a tree farm. Often this is done in a little ceremony, with the presentation of a certificate and a sign to mark the property as one devoted to production of forest crops.

As a rule, wide publicity is given to such certifications. The object of this publicity is twofold. First, it points to the property as an area which demonstrates what good forest practices are, and what they can accomplish. Second, it helps to create public understanding and appreciation of forest area as cropland. Newspaper and radio publicity is often reinforced by distribution of literature.

In general practice, the tree-farm movement does not provide individual instruction in land management, although there are instances where this has been done. But, in many states, the movement is tied in closely with such activities, by state or other agencies.

Actually tree farms are co-operative ventures. The land is privately owned, but the owner must enlist co-operation to protect his trees from fire. When that job is done well, both the tree farmer and the public share in the profits of the timber harvest. The owner benefits by profits from the sale of wood and the public through employment and the economic stimulation that follows the manufacture of useful products.

Perhaps the most potent factor in advancing the tree-farm movement in the United States has been the lure of profit to the individual woodland owner. However, it has been an honest lure.

Certified tree farms, under this system, range from 5 to 700,000 acres (2 to 280,000 ha). It so happens that both the largest and the smallest are in Texas, where more than one acre in every four of privately owned forest land has been certified under the tree-farm banner. Texas, incidentally, is one area in the United States where timber growth exceeds timber drain. It is credited by the United States Forest Service with having a higher percentage of privately owned forests under good management than any other state in the nation. In Washington state, where the idea originated, more than 20 percent of private forest lands have been certified as tree farms.

A common conception of tree farms is that they consist only of large industrial holdings. Actually, about 60 percent of the 1,387 units certified to date are owned by farmers, 23 percent by industries, and 17 percent by general investors. One 80,000-acre (32,000-ha) western pine tree farm in New Mexico is owned by the Boy Scouts of America. In terms of area, however, farmers have about 500,000 acres (200,000 ha), investors about 2,000,000 acres (810,000 ha), and the rest is industrially owned.

Nothing in the requirements of the tree-farm system regulates the end product. Trees on a certified farm may be cut for pulpwood, poles, pilings, mine props, railroad ties, sawtimber, or for any combination of markets. The primary consideration is profit to the owner.

In Tennessee, Ohio, Pennsylvania, North Carolina, South Carolina, and New Jersey a number of woodland owners have come into the program with hardwood forests. The tree-farm movement promotes all types of forests—its primary consideration is the production of more trees for future crops of usable wood.

There is more to tree farming than hanging up an attractive sign on the gate that reads "Certified TREE FARM, John Smith, Owner."

The landowner, when he places a tree-farm sign on his property, is making a public pledge that he will

conscientiously manage his property to assure a continuous succession of tree crops. Some sponsors require that the owner prepare, and submit for approval, a plan for operating his wooded lands certified under the tree-farm agreement. In all cases his actual practices must be approved after qualified inspection.

The tree-farm program, since its inception in 1940, has been most enlightening even to the owners themselves. This is as true of the large timber operators, who count their acres in the thousands, as it is for the farmer with 20 acres (8 ha.) of second-growth pine on his north forty. Both have profited from the experience and both stand to profit a great deal more in the future. So too will the communities around these tree farms through the increased income that results from boosted production in wood crops and the steady payrolls that they bring.

Keep America Green Movement

Any discussion of the American tree-farm system is incomplete without some mention of the Keep America Green movement. Keep America Green, like the tree-farm program, began in the state of Washington. Like the tree-farm program, it has spread across the United States.

The two programs go hand in hand and support each other. The Keep Green Movement is, in simple language, a program for mass education in forest-fire prevention. Every Keep Green movement is well rooted in the local community.

Nine-tenths of all forest fires in the United States—and they annually burn over an area equal to that of New York state—are man-caused. These fires are the direct result of carelessness or ignorance. They start when motorists toss burning cigarettes out of car windows, when hunters drop lighted matches in the woods, when recreationists leave untended campfires, or when farmers set fire to weeds along their fence lines and let the flames spread to nearby timber.

The Keep Green program is specifically aimed at preventing fire losses of that kind. The technique has been simple and effective. Local organizations interested in fire prevention appeal to the public on a self-help basis by pointing out how forest fires rob everyone. They point out what fire-damaged forests mean in reduced payrolls, in reduced buying power, in reduced output of needed materials, and in loss to the local community and to the nation in wood resources.

In other words these local Keep Green committees, whether functioning in Florida or California, prove that forest fires are everybody's business because they result in everybody's loss.

Where the Keep Green educational job has been well done, forest fires and the damage they do become pretty tangible to even the most calloused and careless citizen. He no longer sees a forest fire as an impersonal thing that burns up somebody else's trees on some distant hillside. He sees it as it really is—a fire that is burning up potential homes, potential newsprint, potential tax money, and potential jobs.

The program is being carried on through schools, clubs, women's organizations, youth groups, and sportsmen's associations. The local Keep Green committees, through their state organizations and with the advice and assistance of their national sponsor, the American Forest Products Industries, Inc., keep the subject of forest-fire prevention constantly [illegible] the public. Working through the newspapers [illegible] zines, radio, motion pictures, and advertising age[illegible] cies, the economic logic behind the Keep [illegible] Green slogan is being spread far and wide.

The Tree Farm and Keep America Green [illegible] have grown while the country as a whole has [illegible] more conscious of its forests. Indeed, it is no exaggeration to say that these programs have contributed a great deal to an increased awareness of the nation's dependence upon forest products and the necessity for more purposeful and constructive land management.

Facing the Facts

The basic facts relating to American forests are becoming better known. We know that the nation's 461 million acres (187 million ha.) of commercial forest land are adequate to meet the nation's increasing demands for wood, and still have enough for reasonable export. But we know, too, that these acres are not now meeting their full responsibilities, and that much must be done to bring them into full production. We take encouragement in the fact that today, for the first time, the United States is growing almost as much timber, of all types, as it is using or losing to fire, insects, and disease. We take encourage-

Prominently displayed along a highway is a sign marking a western pine tree farm.

Showing how nature responds to tree-farming practices in the western pine region. This almost pure ponderosa pine forest is part of the Dan Gamble Memorial Tree Farm near Brewster, Wash. Heavy reproduction is about 10 years old. Picture taken Oct. 1945.

ment in the fact that, although sawtimber growth is still on the deficit side, here, too, improvement can be seen if we compare today's facts with yesterday's facts.

The improvement has not been enough, nor rapid enough. Sometimes it seems that foresters and those interested in forests spend too much time debating just how bad, or how good, the national situation may be with respect to forest growth. All of us, whether optimist or pessimist, can recognize that a big job remains to be done, and more is to be accomplished by tackling the job than by arguing just how big it is.

It's too big for any one of us working alone. The tree-farm movement is not a complete answer, nor does it pretend to be. It is one of the steps being taken, with generous co-operation by many agencies, first to understand, then to solve the forest problems of the country. While progress sometimes seems slow, as we work from month to month and from year to year, yet it is striking if we look back only 10 years.

No progress in American forest management can get too far ahead of public thinking. Nor too far ahead of public habits. That is why I believe that the Tree Farm movement—relating to forest management—and the Keep America Green movement—relating to forest-fire prevention—are contributing substantially to the rich soil of public understanding in which an expanding forest growth thrives best.

Photos accompanying this article are furnished by courtesy of the American Forest Products Industries, Inc.

Irrigation Agriculture in its Relation to Lumber Requirements

as illustrated by the California Fruit and Vegetable industry

By GEORGE F. BURKE and RUSSELL W. BEESON[1]

IN areas where agriculture produces fruits and vegetables for distribution and sale in urban markets, the producer requires wood packaging for his wares, so that they will reach distant markets in usable condition. This is most notably true where irrigation agriculture is the common practice, since the regular and assured flow of goods from it falters or breaks down unless wooden crates and boxes are available as needed.

The importance of fruits and vegetables as "protective foods" in the diet is generally recognized by world experience and research. In many lands where agriculture now concentrates on grain crops, some shift to fruit and vegetable crops is most desirable from the international standpoint. It is well to recognize that to make these widely available to consumers, a supply of forest products suitable for boxes must be at hand.

Agricultural boxes can be made from fairly low-quality trees, logs, and boards. This is common practice, and keeps the cost down. It is important that, as a matter of cost, the source of raw material — the forests — be as close as possible to the centers of agricultural production.

A country that aims to diversify its agriculture, to produce protective food supplies for its people, would be well advised to look to the proper development and management of its forests. A healthy, diversified agriculture, adequate nutrition, and effective forestry are all related elements in the one great problem of bettering human welfare.

The dependence of irrigation agriculture on forests and wood is well illustrated by the situation in the state of California, U.S.A. In this state agriculture is a highly organized business; its products are standardized, packaged for consumer use, and widely distributed.

Reports of this kind are not too commonly made, and the comparatively recent California experience may be useful to other areas in other countries which have a similar development of irrigation agriculture and make similar use of wood for handling and shipping fruits and vegetables.

California has 17 million acres (6.9 million ha.) of commercial forest lands from which is cut annually more than 2,500 million board feet (5.9 million m^3 (s)) of lumber. Approximately 840 million board feet (2 million m^3 (s)) of lumber, or the equivalent of 34 percent of the total production, is used locally for agricultural containers. To the agriculturists of California, as well as to many other users of California timber, maintenance of productive forests is thus a matter of prime importance.

Agricultural shook for field and shipping containers is the largest use of lumber[2] produced in California. Wood has proved to be the most suitable material for such containers because of its ability to withstand comparatively hard usage and its relative resistance to moisture and temperature changes. Boxes constructed of wood combine the qualities of rigid support and flexibility, which have not yet been satisfactorily duplicated in other materials.

This foremost lumber use derives from the importance of fruit and vegetable production in California. In 1944 California led all other states of the U.S.A. in cash receipts from farm marketing of fruit and vegetables. Its cash farm income of about 662 million dollars for fruits and of 284 million dollars for vegetables represented 47 percent and 19 percent respectively of the national cash farm income for these products.

Several of the more important fruits and vegetables are harvested and transported to packing or processing plants in the customary picking box or field lug. For commercial marketing, fruits and vegetables are shipped largely in specially designed wooden shipping containers, which prior to the war varied widely in size and form but during the war tended more to standardization for each commodity. Rail shipments are held in place by bracing lumber and stripping material. Wooden trays are used in sun-drying and dehydration of certain fruits and raisin grapes, and sweatboxes serve mainly as farm storage receptacles for dried fruits and raisins during the period of moisture equalization termed "sweating."

A preliminary study of agricultural box shook requirements in California was made in January 1943 by the California Forest and Range Experiment Station, at the request of the Office of Agricultural War Relations of the U. S. Department of Agriculture. This study revealed that construction of agricultural containers constituted the most important use of lum-

[1]This article is based on a survey made by the authors in 1945, with some amendations by them and by FAO officials.

[2]Excludes plant maintenance and new construction.

ber produced in California. When a national reappraisal of timber supplies was being made in 1945, it seemed advisable to investigate further this part of the lumber consumption picture, which is so important to California agriculture.

Scope of Study

The report comprises (1) estimated lumber requirements for agricultural shook for the California fruit and vegetable industries as a whole, and for fresh and processed products separately; (2) estimated production of agricultural shook in California; and (3) the outlook after 1945, including a discussion of probable requirements, possible developments, and requirements compared with production. Lumber for plant construction and maintenance is not included in these estimates.

Lumber Requirements for Agricultural Shook

Table 1 summarizes the lumber requirements for the fruit and vegetable industries in California for 1944 in terms of shook and for 1940-44 in terms of both shook and gross lumber footage.

For Fresh Fruit and Vegetable Shipments

Box Shook

Container requirements for shipment of fresh fruits and vegetables in terms of gross lumber volume represent about 84 percent of the total requirements for the California fruit and vegetable industries. For 1940-44, roughly 600 million board feet (1.42 million m^3 (s)) of lumber was used for fresh fruit and vegetable containers. By commodity groups the requirements were 247 million board feet (0.583 million m^3 (s)) for vegetables, 215 million (0.507 million m^3 (s)) for citrus fruits, and 138 million (0.326 million m^3 (s)) for deciduous fruits and grapes.

Shook requirements are given in Table 2 by commodities. The estimates are based on the amount of shook required for containers per car and the number of carlot shipments of major commodities.

Pears are sorted, wrapped and boxed in a California packing house.

TABLE 1.—Lumber Requirements for Agricultural Shook, Fruit and Vegetable Industries, California; 1944 and Average 1940-44[1]

Container or other use	Shook requirements (average "fall-down" in manufacture: boxes, 15%; trays, 25%)		Gross lumber requirements, average 1940-44
	1944	Average 1940-44	
	(1,000 bd. ft.[2])		
Vegetable	264,540	247,010	290,600
Citrus fruit	199,220	214,690	252,580
Deciduous fruit and grapes	128,240	138,430	162,860
Total for fresh fruits and vegetables	592,000	600,130	706,040
Stripping lumber	29,610	28,680	28,680
Bracing lumber	27,140	26,290	26,290
Dried fruit	24,980	24,980	29,390
Picking boxes	25,000	25,000	29,410
Drying trays	10,040	10,040	13,390
Dehydrator trays	2,360	2,360	3,150
Sweatboxes	4,000	4,000	4,710
Total for miscellaneous uses	123,130	121,350	135,020
Total	715,130	721,480	841,060

[1]Bases for estimates are described in the text under the separate headings.
[2]1,000 bd. ft. of lumber equal 2.36 m^3 (s).

The amount of shook required for containers per car was calculated from the following information: (1) size of container most commonly used for each commodity; (2) number of board feet per container; (3) number of packages per carload. An average of 1,525 board feet (3.6 m^3 (s)) of shook is required per carload of vegetables, 1,914 board feet (4.5 m^3 (s)) per carload of citrus fruits, and 2,500 board feet (5.9 m^3 (s)) per carload of deciduous fruits.

The carlot shipments include the carlot equivalents of total truck shipments within the state. Total intrastate truck shipments are usually assumed to be double the unloads at San Francisco and Los Angeles because only about half the state's population is in these two metropolitan areas. However, many of the products consumed in the interior valleys or received in metropolitan areas, particularly Los Angeles, are not packed in the usual shipping containers but are handled in bulk or in second-hand containers. To reflect truck shipments requiring new shook, therefore, a more reliable figure was obtained by adding to the San Francisco-Los Angeles truck unloads only 50 percent of the volume of such receipts instead of doubling it. Carlot shipments of peaches, pears, apricots, and grapes have been adjusted to exclude rail shipments of these products to processing plants, since the container used is the usual field lug box, which remains in service for years.

Car Bracing and Stripping

In addition to the boxes, each carload of fruit or vegetables requires, on an average, 110 board feet (0.26 m^3 (s)) of bracing lumber and 120 board feet (0.28 m^3 (s)) of lath stripping to secure the load. As about 239,027 carloads were shipped annually by rail during 1940-44, the estimated volume of lumber used was about 26 million board feet (61,000 m^3 (s)) for bracing and about 29 million board feet (68,000 m^3 (s)) for stripping.

TABLE 2.—CARLOT SHIPMENTS AND SHOOK REQUIREMENTS, CALIFORNIA FRESH FRUIT AND VEGETABLES, 1944 AND AVERAGE PER YEAR 1940-44

Commodity	Wood content of shook in commonly used container	Packages per car	Shook per car	Carlot shipments 1944	Carlot shipments Average 1940-44	Shook requirements 1944	Shook requirements Average 1940-44
Vegetables	*Bd. ft.*		*Bd. ft.*			(*1,000 bd. ft.*[1])	
Asparagus	3.33	640	2,131	3,212	3,855	6,844	8,215
Beans (snap & lima)	4.60	320	1,472	2,352	3,100	3,462	4,563
Beets	4.60	320	1,472	1,003	1,223	1,476	1,800
Broccoli	3.31	440	1,456	2,362	1,881	3,439	2,739
Cabbage	3.07	400	1,228	6,749	6,510	8,288	7,994
Cantaloupes	4.10	288	1,181	14,291	10,925	16,878	12,902
Carrots	4.60	320	1,472	17,913	16,275	26,368	23,957
Casabas	4.10	288	1,181	596	472	704	557
Cauliflower	3.31	440	1,456	10,844	9,123	15,789	13,283
Celery	3.19	350	1,116	15,903	16,963	17,748	18,931
Corn	3.07	600	1,842	2,258	2,310	4,159	4,255
Cucumbers	2.57	1,000	2,570	717	887	1,843	2,280
Greens (except spinach)	4.60	300	1,380	1,185	1,155	1,635	1,594
Honey Ball melons	4.10	288	1,181	326	564	385	666
Honey Dew melons	3.40	500	1,700	4,142	3,317	7,041	5,639
Lettuce and romaine	4.60	320	1,472	57,364	49,416	84,440	72,740
Mixed melons	3.40	500	1,700	970	1,172	1,649	1,992
Mixed vegetables	4.60	320	1,472	11,198	9,739	16,483	14,336
Peas (green)	2.68	650	1,742	4,307	4,644	7,503	8,090
Peppers	3.90	400	1,560	1,208	1,097	1,884	1,711
Persian melons	3.66	288	1,054	802	670	845	706
Spinach	4.60	320	1,472	2,272	2,479	3,344	3,649
Strawberries	1.26	1,200	1,512	345	1,420	522	2,147
Sweet potatoes	3.25	500	1,625	2,116	1,939	2,438	3,151
Tomatoes	2.68	650	1,742	14,962	15,321	26,064	26,689
Turnips, rutabagas	4.60	320	1,472	1,567	1,644	2,307	2,420
TOTAL VEGETABLES				180,964	168,101	264,538	247,006
Citrus fruits							
Grapefruit	4.26	460	1,960	4,231	5,081	8,293	9,959
Lemons	4.44	400	1,776	20,384	22,451	36,202	39,873
Mixed citrus	4.26	460	1,960	2,913	2,793	5,709	5,474
Oranges and Satsumas	4.26	460	1,960	76,030	81,319	149,019	159,385
TOTAL CITRUS				103,558	111,644	199,223	214,691
Deciduous fruits and grapes							
Apples	4.79	760	3,640	3,291	4,294	11,979	15,630
Apricots	2.45	1,100	2,695	2,389	1,309	6,438	3,528
Cherries	2.68	1,100	2,948	7,390	1,111	4,098	3,275
Grapes	2.57	1,000	2,570	24,533	30,296	63,050	77,861
Mixed fruits	1.41	1,300	1,833	620	464	1,136	851
Peaches	1.41	1,300	1,833	10,482	8,397	19,213	15,392
Pears	2.62	675	1,768	4,365	5,501	7,717	9,726
Plums, fresh prunes	2.57	900	2,313	5,980	4,891	13,832	11,313
Tangerines	3.63	800	2,904	267	294	775	854
TOTAL DECIDUOUS FRUITS AND GRAPES				53,317	56,557	128,238	138,430
TOTAL				337,839	336,302	591,999	600,127

[1] 1,000 bd. ft. of lumber equal 2.36 m³ (s).

FOR PROCESSED FRUITS AND VEGETABLES[3]

Dried Fruit

About 560,000 short tons (508,000 metric tons) of dried fruit was produced in California in 1944 of which 25 percent, or 140,000 shot tons, was packed in wooden boxes. The standard 25-pound dried-fruit box contains 2.23 board feet (0.0053 m³ (s)). The shook requirement for dried-fruit boxes, therefore, is 25 million board feet (59,000 m³ (s)).

Picking Boxes

It is extremely difficult to estimate the annual requirement for picking boxes because of the almost complete lack of reliable data. These boxes are used extensively in harvesting eight fruits and two vegetables. They are often reused several times during a season, and the number of years they remain in service depends upon the care used in handling. Information on this subject was solicited from canners, shippers, and growers. The consensus seemed to be that about five picking boxes were required per ton of produce. Therefore, on the basis of tonnage produced and an average life of 10 years for the container, approximately 2,582,000 boxes are required annually for replacement. As these boxes contain 4.7 board feet (0.011 m³ (s)), the annual shook requirement for new picking boxes is about 12 million board feet (28,000 m³ (s)). The information received also indicated that an approximately equal footage was needed for the repair of old picking boxes. The total requirement, therefore, for box shook used in new picking boxes and for repair is roughly 25 million board feet (59,000 m³ (s)).

[3] Excludes cannery shook. Fiberboard has largely replaced wood in the manufacture of shipping containers for this purpose and lumber now used is relatively unimportant.

Peaches unloaded at a California cannery.

Sun-Drying and Dehydrator Trays

It is estimated that about 10 million board feet (24,000 m^3 (s)) of shook is required annually for trays used in sun-drying deciduous fruits and raisin grapes and slightly more than 2 million board feet (4,700 m^3 (s)) for dehydrator trays. For each fruit separately and for each method of drying, these estimates take into account (1) the average annual volume dried; (2) the length of the drying season; (3) the time required to dry each spread or charge; (4) the number of times each tray is used per season; (5) the number of pounds of fresh fruit per tray; (6) the ratio of fresh weight to dry weight or drying rates; and (7) the average tray life, which was assumed to be 10 years for sun-drying and 6 years for dehydration. From these data it was possible to estimate the total number of trays required and the number of each kind required annually for replacement. The conversion to board feet of shook was accomplished by multiplying the number of trays needed for replacement by the footage contained in the average-sized tray, 10.31 board feet (0.024 m^3 (s)).

Sweatboxes

Approximately 4 million board feet (9,400 m^3 (s)) of shook is required annually for sweatboxes used in storing dried peaches, apricots, figs, and raisins during the period of moisture equalization and preceding final packaging for market. The sweatbox preferred in practice is constructed of pine lumber and has a capacity of about 200 pounds (91 kg). This size box contains about 16.11 board feet (0.038 m^3 (s)) of shook. It is generally used once during the season and has an average life of about 12 years. The annual shook requirements were estimated from these data and the average volume of the designatd fruits dried per season.

Estimated Production of Agricultural Shook

Approximately 45 box factories in California produce agricultural shook. Most of them are operated in conjunction with sawmills. Although a few factories maintain selling organizations, the majority sell through distributors handling only this phase of the business. The four distributors that handle the bulk of the sales maintain storage warehouses and assembly plants strategically located throughout the state. Because of lack of labor many of the assembly plants were closed during the war. With the advent of normal times it is presumed that these services will again be offered to purchasers of box shook.

During the war, inventories of box shook in the hands of producers, distributors, and consumers were extremely low. Therefore the records of shipments from mills were a fairly accurate representation of production for the period. Box lumber in normal times grades about 75 percent No. 3 Common and 25 percent No. 4 Common. Obviously, with this grade of lumber, there is considerable "fall-down" in the manufacture of shook. The accepted figure is 15 percent.

In 1944 California factories produced approximately 500 million board feet (1.18 million m^3 (s)) of agricultural shook[4] from 588 million board feet (1.39 million m^3 (s)) of lumber. Not all of California's shook production, however, was available for local use. About 5 percent, or 25 million board feet (0.06 million m^3 (s)) was shipped to consumers in such states as Utah, Nevada, New Mexico, Colorado, Arizona and Texas.

The difference between the volume of shook required in the state (721 million board feet = 1.70 million m^3 (s)) and the volume produced and used locally (475 million board feet = 1.12 million m^3 (s)) is 246 million board feet (0.58 million m^3 (s)), or 34 percent. All but a small amount of this deficit was produced by factories located principally in the area from Bend to Klamath Falls in Oregon state. The production of factories in the Pacific Division area (western, central, and southern Oregon, California, Arizona, New Mexico, and Colorado) exceeded California's total requirements by only about 100 million board feet (0.24 million m^3 (s)).

The Outlook

Probable Requirements, 1945-64

In terms of carloadings per year, commercial marketing of California fruits and vegetables customarily marketed fresh in new wooden containers averaged about 10 percent more during five of the war years (1940-44) than during the 10-year period immediately preceding and about 7 percent more than during the 15-year period after 1930.

Requirements for agricultural containers at the time of this report (1945) were difficult to forecast. Material changes might occur during the next two

[4]In addition, California factories produced about 86 million board feet (0.20 million m^3 (s)) of war and industrial shook. Thus agricultural shook represented about 85 percent of total 1944 shook production. A much smaller annual annual volume of non-agricultural shook is forecast in peacetime. Agricultural shook will therefore make up a larger proportion of total production (possibly as much as 95 percent) in the years ahead.

decades in the proportions of fruits and vegetables marketed in fresh and in processed form. Competing areas of production might cut into the volume of fresh products shipped from California, and changing methods of transportation and distribution are likely to affect the volume packaged in the customary types of containers — whether those containers be made of wood or other materials. Such changes cannot be predicted.

Nevertheless, most competent observers believe that California fruits and vegetables will retain approximately their present proportion of the national market and that commercial marketings of the major commodities will continue at about the present level. This assumption is based on past history and indicated trends of production and utilization.

Possible Developments

Since commercial marketings of California fruits and vegetables are expected to continue at about the present level, it follows that annual lumber requirements will also remain about as great — 841 million board feet (1.98 million m^3 (s)). The greatest single factor than can logically be expected to reduce present-day shook consumption and force a shift to substitute materials for containers is the predicted decline in mill output in the relatively near future because of dwindling supplies of raw material.

Production of agricultural shook during the war years was a constant source of worry to consumer and producer. The shortness of supply was accentuated by the heavy demand for industrial shook for overseas shipment of military equipment — an obligation that had to be shouldered for the most part by existing agricultural shook factories. Supply after Pearl Harbor was barely adequate, and the situation will very likely remain unfavorable in view of a continuing heavy demand as contrasted to the ever-decreasing supply of suitable and readily available timber. It is estimated that many of the California pine region mills will be out of stumpage within a relatively few years. An indication of the anxiety about this is the recent purchase by the Fruit Growers Supply Company of 80,000 acres (32,000 ha.) of timber. The express purpose of this transaction was to secure an additional supply of timber badly needed to sustain its output of box lumber. Lumber used in the manufacture of citrus crates alone for the period 1940-44 grossed 252,580 thousand board feet (0.60 million m^3 (s)). Only the requirements for vegetable shook exceeded this figure.

Continuing heavy demands for agricultural shook during the years ahead will very likely result in greater use of species now considered inferior to the commonly used ponderosa pine. A trend in this direction is already evident in the use of white fir for containers, which has increased considerably in recent years. White fir lumber production in California has nearly tripled since 1941. A continuing trend in this direction, together with a greater utilization of second-growth ponderosa pine, which theoretically should show a gradual increase as the old-growth timber is removed, will tend to relieve some of the pressure on old-growth ponderosa pine. However, it is doubtful whether these sources of supply will take up the full slack. A companion development, assuming a lumber deficit in the near future, will logically be substitutes for wood in the construction of containers for fresh shipment or greater reliance on lumber [illegible] outside the state.

Requirements Compared with Production

Although the fruit and vegetable industries in California require approximately 841 million board feet (1.98 million m^3 (s)) of lumber annually for agricultural shook, only about 588 million board feet (1.39 million m^3 (s)) of lumber from California [illegible] approximately 24 percent of the volume produced (2,469 million board feet = 5.83 million m^3 (s)) was converted into shook for agricultural use in 1944. Ponderosa pine is the species considered most suitable for containers and has been the species most widely used for this purpose over the years. According to census compilations, about 1,059 million board feet (2.5 million m^3 (s)) of ponderosa pine lumber was produced by the California pine region mills in 1944. If ponderosa pine had been used exclusively, approximately 55 percent of this output would have been converted into agricultural shook. Other species, however (mostly sugar pine and white fir), were used to some extent and since practically all the agricultural shook manufactured in California is from lumber produced in the pine region the proportion of the regional output (1,821 million board feet = 4.3 million m^3 (s)) that was converted into agricultural shook was 32 percent. About 46 percent of pine region production would be needed if the full requirements of the industries of 841 million board feet (1.98 million m^3 (s) were supplied within the state.

Lumber production in California reached a new high in 1944, being about 5 percent more than in the peak year of 1943. Although production in the pine region was up 5.4 percent, it is significant to note that the output of ponderosa pine dropped 6.7 percent, while other species generally showed increases, mainly white fir (+ 60.9 percent), sugar pine (+ 16.7 per-

Cherries being sorted and boxed in a California packing house.

cent), and Douglas fir (+ 9.7 percent). The decrease in the cut of ponderosa pine and the increases noted for other species may be an indication of future trends.

Summary

It is estimated in this study that the fruit and vegetable industries in California used approximately 721 million board feet (1.70 million m^3 (s)) of shook annually during the five years 1940-44. The volume in terms of gross lumber requirements was 841 million board feet (1.98 million m^3 (s)). The total lumber requirements in 1944 were only slightly less than the average for the 5 years. The major lumber requirements for different classes of use were: vegetables 291 million board feet (0.69 million m^3 (s)), citrus 252 million board feet (0.59 million m^3 (s)), deciduous fruits 163 million board feet (0.38 million m^3 (s)), car stripping and bracing 55 million board feet (0.13 million m^3 (s)), dried fruits 29 million board feet (0.07 million m^3 (s)), picking boxes 29 million board feet (0.03 million m^3 (s)), drying trays 13 million board feet (0.03 million m^3 (s)), dehydrator trays 3 million board feet (0.01 million m^3 (s)), and sweatboxes 5 million board feet (0.01 million m^3 (s)). The lumber used for containers for marketing fresh products alone was 706 million board feet (1.67 million m^3 (s)) or 84 percent of total gross lumber requirements.

Although it is extremely difficult to forecast requirements, most competent observers assume, on the basis of past history and indicated trends of production and utilization, that California fruits and vegetables will retain approximately their present proportion of the national market and that commercial marketing will continue at about the present level. It presumably follows, therefore, that for many years to come annual lumber requirements will remain about as great as the 1940-44 average.

California factories are not able to supply all the shook required. In 1944 plants located in California produced approximately 500 million board feet (1.18 million m^3 (s)) of agricultural shook, largely ponderosa pine. About 5 percent of this volume (25 million board feet = 0.06 million m^3 (s)) was shipped mainly to consumers in nearby states. The 475 million board feet (1.12 million m^3 (s)) remaining supplied about two-thirds of California requirements. Factories located principally in the area from Bend to Klamath Falls in Oregon produced all but a small amount of the deficit of 246 million board feet (0.58 million m^3 (s)). About 46 percent of total lumber production from the pine region would be needed if the full requirements of the industries of 841 million board feet (1.98 million m^3 (s)) were supplied within the state.

It is predicted that California's timber supply, particularly ponderosa pine, will continue inadequate in the years ahead. Accordingly, it is expected that fruit and vegetable producers, in addition to using greater quantities of lumber from less desirable species, will be forced to rely more on lumber sources outside the state or to develop suitable substitute materials.

Many other areas of the world, with similar agricultural production and a waning timber supply, may be faced with the same set of problems.

Photos accompanying this article were furnished by the U. S. Forest Service.

The Organization and Work of the Swedish Forest Research Institute

By BO EKLUND

SWEDEN, similarly to the two neighboring countries, Finland in the East and Norway in the West, is preeminently a land of forests. Of the total land area—410,600 km^2—some 231,800 km^2 or 56 percent consists of forest land. Owing to Sweden's very considerable length from North to South—the distance between the northernmost and southernmost points is 1,574 km—and the land's northerly situation (between 55° 20′ and 69° 04′, northern latitude) and varying geological, climatic, and topographical conditions, the nature of the forests differs considerably in different parts of the country. Practically the whole country is dominated by conifer forests which either consist of unmixed stands of pine, *Pinus silvestris,* or spruce, *Picea abies,* or of mixed stands of these two trees with an intermixture of birch, *Betula verrucosa* and *B. pubescens,* which are the most commonly occurring broad-leaved trees. In the southern part of the country stands of rarer broad-leaved species, principally beech, *Fagus silvatica,* are also found.

Extensive forest exploitation in the past and the resulting legislation have had profound effects on the Swedish forests today. The exploitation of the natural forest resources—in many cases conserved for centuries—has proceeded without interruption for nearly a hundred years but is now reaching its conclusion: the last remnants of the primeval forests in northern Sweden, where exploitation began much earlier than in other parts of the country, have now been almost entirely cleared.

In order to ensure a supply of raw materials for Sweden's forest industries, it is essential for the nation to build up a productive forestry. Conversion from exploitation to a productive basis was initiated some decades back in many parts of the country, but much remains to be done before the productive capacity of our forest land and its growing stock can be utilized more effectively. The need for a deeper knowledge of the conditions of forest growth and of the results that may be anticipated from the conservation measures Sweden adopts must be regarded as an essential prerequisite.

Increased knowledge can only be gained, however, by extensive forestry research, the main purpose of which is to afford an efficient guide in all practical matters relating to production. Work in the numerous fields of forestry research is accompanied by difficulties, many of them connected with the long period of growth. Furthermore, present-day Swedish forestry is marked by a special characteristic, namely that the yield of wood is cut progressively as thinnings during the greater part of the life of the stand. Under conditions of growth prevailing in Sweden, a period of 80 to 100 years or more usually elapses between reforestation of a stand and its cutting; it is then possible to survey the total yield and judge the effect obtained from the application of a certain forestry program. On this account, forestry research, unlike agricultural research, has not thus far had the

Old, very slow-growing spruce stand of a type common in northern Sweden.

benefit of personal experience and observation in connection with the most suitable system of forestry to be followed under varying conditions.

As far back as the end of the nineteenth century a project was formed to set up a central research body for forestry under state administration, providing for scientific handling of a series of important problems. After various proposals had been submitted and numerous discussions had taken place, the Forstliga Försöksanstalten, or as it shortly afterwards became known, Statens skogsförsöksanstalt (Swedish Institute of Experimental Forestry) was established in 1902. This institute was originally organized on very modest lines. It was soon recognized, however, that the requirements of the organization had been considerably underestimated, with the result that in 1912 state authorities voted funds for an appreciable extension of its activities and for the erection of a special institute building at the Experimentalfältet close to Stockholm, which was occupied in 1915.

The last few decades have been accompanied by important developments in Swedish forestry, especially more intensive forms of cultivation, and the need for forestry research has increased in step with these developments. The scope of the 1912 organization was soon found to be inadequate and a further extension became inevitable. Proposals for a new organization, based on a series of reports dealing with present and estimated future research requirements, were placed before the parliament in 1939 and were approved in principle. In consequence of world events the reorganization was not carried out until 1944. It resulted in increase in staff and material resources, the erection of a new institution building, and the rebuilding and extension of the older building. Further additions to the organization were made during 1945 and 1946. In conjunction with the reorganization the name was changed to Statens skogsforskningsinstitut (Forest Research Institute), which more adequately represents the nature of the Institute's activities.

The Forest Research Institute has two main tasks: 1) to determine the most suitable methods for the conservation of forests under different conditions, and 2) to keep running inventories of the country's available forest resources. These general headings cover a series of the most varied tasks, a number of which are associated with the basic forest research plan, while others relate to the research methods adopted. In order to meet the requirements, work is carried on by five divisions—dealing with Forestry, Statistics, Botany and Soils, Genetics, and Zoology—all of which are under the Director of the Institute, who bears a professor's title, and is also head of the Statistical Division. A general secretarial office is available for the whole Institute. The Institute is governered by a board which is common to the Skogshögskolan (Swedish College of Forestry) and the Forest Research Institute.

The director's chief duty is to co-ordinate and direct the work within the Institute and to maintain contact with other research institutes and with the practical side of forestry. For the management of the Statistical Division, which deals with forest surveys and cutting statistics, the director is represented by a special research leader, and for dealing with administrative and financial matters he is represented by a secretary who also officiates as secretary to the board.

A professor is in charge of each of the other five divisions, with one or more research workers and assistants under him. The head of a division and his research leaders each have a special field of research allotted to them. In addition, trained forest rangers, laboratory assistants, calculators, etc., are attached to the different divisions. In the year 1947/48 the staff numbered 110. During the field-work season, from May to October, a large extra staff is employed. The annual budget for the Institute amounts to approximately 1¼ million Swedish crowns ($350,000 U.S.).

A great part of the work, as is common in forestry research, must be based on material obtained from observation and research in the field, which in the great majority of cases can be concentrated in permanent or temporary sample plots. The Forest Research Institute now has more than 900 permanent sample plots at its disposal and about 1,000 temporary plots, distributed over practically the entire country. The first permanent sample plots were laid out in 1902, so that it has been possible to keep them under observation and carry out regular surveys over a long period of years. In view of the new and, in some cases, epoch-making working systems based on modern analytical methods of a mathematical-statistical nature, it is probable, however, that future field research work will be confined to sample plots subjected to a single survey. In addition, the Forest Research Institute has under its control four experimental parks, two of which are in the North and one each in Central and South Sweden. The purpose of these experimental parks, which comprise a total area of 3,400 hectares of forest land, is partly to allow certain research work to be centered in a district for which a careful inventory and description has been prepared, and partly to

Sample plot in a North Swedish pine forest, about 85 years of age.

permit forest management measures to be studied when applied on a large scale.

The foregoing gives a general idea of the Institute's organization and activities. To complete the picture, however, it is necessary to refer to the work of the different divisions.

The Forestry Division

The Forestry Division deals with research work relating to silviculture, forest mensuration, and forest technology. The chief task of the division consists in making practical deductions in connection with the main problems of silviculture. Its research work touches upon all phases of the long production period between the reforestation of the stand and its final cutting. Thus it covers all problems associated with forest management during the long period of growth —when the first thinning should be undertaken, the frequency and extent of thinning, and the most suitable time and method of cutting mature trees. It also deals with the best methods for producing new forests to replace the old ones. The work is therefore directed as far as possible towards discovering the most suitable methods of forest management to adopt in order to achieve the best possible economic yields. Widely varying problems are encountered in actual management and reforestation, and the work takes the form of both production research and reforestation research.

Investigations have been carried on for a long time by international forestry research bodies with the object of determining the stand development and yield on varying site-class qualities when employing a single method of thinning. The material investigated has comprised permanent sample plots which have been treated for long periods on similar principles insofar as the methods and amount of thinning were concerned. The aim of the work was to determine the effect of the cutting program adopted on the progress of development and yield, by simple graphic comparisons of the estimated yield results from sample plots, representing similar starting points with respect to habitat factors and stand structure. Production research by this method must be spread over a very long time, since it must include the greater part of the stand's period of growth.

In order that the demands of practical forestry for scientific guidance in the efficient management of a stand could be met within a reasonable time, it became necessary to alter production research for more rapid results. Research work of this kind has consequently been directed toward a closer investigation of the stand's manner of growth under varying natural conditions and different methods of treatment. The main purpose of the work is to produce statistical data from which general deductions concerning the observed growth may be drawn, based on the observations carried out over short periods of development—representing the growth between two thinnings, or about five years. In this way it is possible to estimate the probable future growth, i.e., to predict the development of forest stands representing widely varying initial conditions of stand locality and cutting conditions. Statistical analysis may be regarded as an experimental branch of research; in order to produce statistical functions that can be satisfactorily applied, the ordinary tasks of research must be approached

Machine for measuring the annual rings of forest trees. The machine can make about 500 measurements per hour with an accuracy of 0.01 or 0.1 millimeter per annual ring.

from new starting points, a process that usually entails far-reaching calculations. On this account it has been necessary to organize a large calculating department, which is provided with the most up-to-date equipment, including machines for sorting and adding punch-cards.

Starting from the functions of growth, production tables are prepared which show the development and yield of a stand, with respect to quantity and value, based on varying combinations of assumptions concerning the structure of the stand and the cutting program adopted. By this means it is possible to make an objective comparison of the results obtained with various forms of stand management, starting from identical initial stand conditions, which is never possible in direct practical research. On the basis of such comparisons, conclusions can be reached as to which form of silviculture will prove most advantageous in each particular instance.

It was necessary to base the production analyses carried out hitherto on the Institute's permanent experimental plots. These were originally laid out and subsequently managed with a view to practical research work over long periods and they were not intended from the outset for statistical work along modern lines. The work has therefore been accompanied by difficulties which are not usually inherent in the statistical methods as such. On this account the laying out of a large number of sample plots over the whole country has been in progress for some years. It is intended to lay out from 4,000 to 5,000 temporary plots, from which comprehensive data can be collected by a single survey.

The growth in diameter of trees is examined by boring and measuring the width of the annual rings; measurement is done by special machines. Apart from the time gain, which is of decisive importance, there are other advantages to this method of investigation. It is possible to determine the growth in diameter far more accurately than by repeated diameter measurements on permanent plots. In view of the fact that the sample plots are now of a temporary character, representative sample trees can be cut for a comprehensive series of measurements and observations to determine the quantity and quality of yield.

The new production research methods relating to pine, spruce, and birch forests, as well as mixed stands of conifers and hardwood, have a further purpose, however, apart from the possibility of predicting production. By the provision of a large number of sample plots on which growth can be accurately determined and described in detail as regards the nature of the site and the individual trees, the possibility is afforded of obtaining a deeper insight into the conditions of growth. To this end, careful analyses are made of the ground vegetation on the sample plots and samples of the humus covering and mineral deposits are collected for investigations into the condition of the soil. In addition, samples are taken of the needles in the crowns for chemical analysis. Those characters of the felled trees are observed and described which are believed to be typical of different genotypes of trees. By simultaneously noting both heredity and environment, it should be possible in the statistical work to separate the influence of milieu and race, a point of fundamental significance for the improved culture of forest trees.

In consequence of the great extent of the field work and the lengthy nature of the statistical work, some considerable time must necessarily elapse before the enormous mass of material accumulated from production research can be utilized to advantage. For the immediate future Sweden will have to rely on the information and experience gained from observations made on the Forest Research Institute's permanent sample plots for information relating to the production conditions of a stand under various forms of management.

To a large extent, reforestation work in North Sweden must be based on machinery. The photo illustrates preparation of the ground with caterpillar tractor and special forest harrows.

In connection with the forest production research, experiments on forest products are also being carried out by the forestry division, which of course relate primarily to the wood and its products. Investigations are in progress to ascertain what influence tree race, age, site, method of establishment, and system of management exercise on the yield and quality of sulphate pulp produced from pine wood and sulphite pulp from spruce. These investigations are carried out in collaboration with the central laboratory of the cellulose industry. In connection with the Swedish Wood Technology Institute, which undertakes the actual research, extensive investigations are planned on the technical properties of timber, such as strength, swelling, shrinking, etc., and on the extent to which these properties are due to special characteristics of the site, the stand, and the species.

Rapid clearing of the old natural forests in northern Sweden, which in many cases included fine-ringed timber-free from knots, has brought about a pronounced shortage of high-grade timber for the sawmill and plywood industry. To compensate for the shortage of knotless timber, prunings of trees suitable for the purpose have been carried out in stands of spruce and birch during the last few decades. The influence of pruning on the quality of the timber and the state of health of the pruned tree is being studied.

The transition from exploitation to productive forestry has been accompanied by a lack of balance in age groups in Swedish forests. Particularly in the north of Sweden, where the natural conditions for regeneration are frequently very inferior to those in other parts of the country, there is a marked disparity between forest land with satisfactory reforestation and cleared forest land or land on which regeneration is unsatisfactory. In other parts of the country also there is a great need for the reforestation of cleared areas and land on which the quantity of timber is unsatisfactory. Thus, side by side with production research, reforestation occupies a prominent place in the research program of the Forestry Division. One of the problems in this field is to ascertain under what conditions natural reforestation can be brought about, and the possibilities of improving reforestation results by the more rational clearing of cutting areas, preparation of the ground, and burning over cleared areas.

An inventory of the northern Swedish forest resources was made during the years 1939-43, and the serious nature of the reforestation problem in this part of the country was confirmed by figures. The unduly optimistic view hitherto held concerning the possibilities of restoring great parts of the forest land in this district by natural means had to be revised; actually, new forests could only be produced over wide areas by sowing or planting. Reforestation research is now being undertaken to ascertain the biological possibilities for these two forms of cultivation and the means of improving forest cultivation. Considerable attention is devoted to the development of the forest cultivation methods themselves, with a view to obtaining higher efficiency and reduced costs. According to experiments made, it appears that the

cost of forest cultivation can be appreciably reduced by preparing the ground with special caterpillar tractors.

Forest technological research represents an entirely new branch of work, which, because of limited resources, had been restricted to working studies in silviculture and allied questions. In order to render forestry more profitable and thus raise the standard of living for Swedish woodsmen, who, as far as wages are concerned, are the worst situated of all occupational groups under present-day Swedish social conditions, an intensified investigation of the theory of work is an essential preliminary. For this reason an appreciable increase in the research resources of the Institute is highly desirable.

The Forestry Division's work program also includes research in forest mensuration. Thus, objective methods have been worked out in recent years for computing the volume of standing trees and their distribution into different assortments. A number of these investigations are carried out in collaboration with the Statistics Division, in order to place improved survey methods at the disposal of this division.

Statistical Division

The main work of the Statistical Division is to carry out repeated surveys of Swedish forest resources for the purpose of estimating their extent and condition and recording any changes that occur. Such surveys, undertaken at regular intervals (approximately 15 years) are of vital importance to Swedish forestry and the woodworking industries. They give a reliable idea of the available raw material and the cutting policy can be adapted accordingly.

The importance of obtaining a clear general picture of Swedish forest resources was recognized at the beginning of the twentieth century, and to this end a trial survey was started in 1911 in Varmland, a central Swedish province. The method of survey then adopted—a sample investigation in the form of a regular line survey—has since been used, although in a more developed and improved form, both for the two Swedish National Forest surveys (the first carried out in 1923-29, the second started in 1938 and still in progress), and also for the Finnish and Norwegian national surveys. In applying the line-survey method, various observations and estimations are made along strips of equal width, which are laid out on the ground by the aid of the compass at the same distance from each other. The surveying crew consists of 7 to 10 members. The different classifications of the area, such as distribution into land-utilization classes, into owner categories, site- and age-classes, etc., are based on the measured lengths of the different classes within a 10 or 20 meter-wide strip along the survey line. The direction of the latter is indicated by a rope, approximately 80 meters in length, which the compass-man drags along behind him. The growing stock was previously computed by counting the trees within a strip 10 meters wide, along the line, but it is now estimated on circular sample plots, five or six of which are laid out within every 2 kilometers, this distance being the survey unit. Beside counting the trees, requisite observations are also made on these sample plots, such as measurements of sample trees. On these observations are based the factors for computing the volume, increment, etc.

Reproduction front in a pine forest, Pinus sylvestris, *(Middle Sweden).*

Both the area of the forest land and the growing stock are registered in detail during the survey. The forests are classified according to quality, age classes, degree of density, owner categories, etc. The different owner categories registered are state forests, other public forests (i.e. ecclesiastical forests, community forests, etc.), company forests, and private forests. In southern and central Sweden the last group is further divided into holdings above and below 200 hectares of wooded area. By means of this special classification, it is possible to obtain pertinent data on forest resources and their condition among the different groups of owners.

The survey being a sample investigation, its reliability can be determined with the aid of the calculus of probability. The reliability has a certain relationship to the distance between the survey lines, the size of the sample plots, and the distance between them. A reduction of these distances would naturally increase the accuracy of the result. But it is necessary to

Virgin spruce forest, Picea excelsa *(South Sweden).*

balance greater accuracy with the increased cost of the survey. In estimating growing stock, the aim has been to obtain approximately the same degree of accuracy (a standard error of 1.5 to 2.0 percent) in the different provinces. In northern Sweden the survey lines were laid out in a direction from southwest to northeast, the distance between the lines varying from 6⅔ to 10 kilometers. In southern Sweden a cross-line system is employed, one set of lines passing from north to south and another from east to west, the distance between the lines varying in the first case from 2 to 10 kilometers, and in the second from 1 to 5 kilometers.

Another task of the Statistical Division is to collect data on the annual cut for the entire country. In close collaboration with the Forestry Division, calculations are also made concerning the estimated future quantities of timber and pulpwood that can be cut in the Swedish forests on a sustained-yield basis under various management conditions. A number of such calculations have recently been published for northern Sweden. These show very clearly that a felling policy more restricted than hitherto must be adopted in order to stop the current decrease of raw materials for the large Swedish forest industries.

The numerous and varying registrations collected by the Statistical Division also provide a valuable source of information for special investigations carried out on behalf of different institutions and public authorities.

Botany and Soils Division

Work in this division is devoted to research relating to geobotany, soil biology, mycology and plant physiology, and their related problems, stress naturally being laid on research work with a direct bearing on forest problems. The main task of the division is to investigate the complicated processes that take place in the soil and in the trees, which together constitute the biological background for the productive and regenerative conditions for forest trees. The results of causal research work of this kind can be expected to yield valuable information on a variety of practical problems in the Forestry Division's field.

The growth of a tree is dependent to a very great extent upon the conditions in the ecological habitat of which the tree forms an integral part. This habitat is characterized not only by the original composition of the place of growth as such, but also by the local climate and the competition amongst individual trees. Such competition is very largely three-dimensional. It makes itself felt both in the crown of the tree, where the photosynthesis of the nutriment drawn from the air and through the roots takes place, and in the soil, where water and nutriment are absorbed and where a series of chemical, physical, and biochemical processes take place which, directly or indirectly, are of vital importance to the tree's growth functions. For these reasons it is extremely important to ascertain not only the organic requirements of individual forest trees and their initial characteristics but also the organic processes and collective life in forest land as well as the various types of growth in forests, the requirements of stand localities, and their reaction to various forms of treatment. The supply of latent nitrogen in forest soil, which is a vital production factor, thus has no direct connection with the original condition of the soil but is mainly a result of the manner in which the nitrogen has been conserved in the place of growth.

This many-sized combination of problems must be approached primarily by means of experimental research methods, which implies that the original conditions of habitat must be changed by the adoption of various measures such as thinning, watering, fertilizing, etc. Such measures bring about biological reactions which reflect changes in the standard of nutriment and likewise react upon the structure of the ground vegetation. Ecological experiments of this kind are in progress in different parts of the country and have already shown clearly that the growth of forest trees is at times restricted by lack of nutriment in the soil. On ordinary firm soil this is found to be specially due to a lack of nitrogen, while on sterile peat moor it can be attributed to a lack of mineral salts.

In the geobotanical field investigations are carried out in connection with plant associations in the forests and particularly with respect to the different types of such associations (forest types) and the character of the stand locality. In Swedish forestry the type of forest is a widely used simple expedient for classifying forest land from the point of view of management. For this purpose the type of forest is determined primarily from the nature and composition of the ground vegetation and the frequency of its occurrence, and may be regarded as an indication of

the manner in which a stand of trees should be treated. In geobotanical research the aim is to test and define as closely as possible the value of the different forest types. Since it is scarcely possible in practical forestry to base the measures to be taken in forest management on detailed analyses of the soil, a well-defined schedule of forest types, with the resulting indications for the management of stands, offers the most practical form of procedure in the present state of knowledge. It likewise constitutes part of the research work to ascertain what changes are caused in the forest types by cutting and other measures.

Soil biology research investigates processes of a biological nature, of importance to the life functions of forest trees, that take place in the soil. The soil is one of the sources of nutriment for the tree and its food supply exercises a decisive influence on its growth. Information can also be acquired concerning the part played by the richness of nutriment in forest production, by means of ecological experiments. Thus, it has been found that the production in old spruce forests of a type very common in northern Sweden could be approximateuy trebled by adding fertilizer.

In order to increase the supply of nutriment in the soil the only course available in practical forestry is to attempt to improve the relations between the supply and demand for nutritive substances by appropriate cutting, and to bring about conditions in the soil that are most favorable to the organic processes. The task of soil biology is, therefore, to accumulate information on the organisms in the soil, their influence and organic requirements, their reaction with one another and on the roots of the tree, etc.

Research has hitherto been directed primarily towards ascertaining how the tree's nutriment is released from the store concentrated in the soil, by means of thinning and the killing of bilberry bushes or heather with chlorate or in some other manner. The effects of fertilizing in this way are now generally known in principle. Taking the long view, however, it is equally important to determine the rate and the extent to which the nutriment in the soil is renewed, since the possibility of carrying on permanent forestry without exhausting the nutritive qualities of the soil is dependent upon the answer to this question. In this respect the biology of forest soil presents a practically unexplored field of research.

In the mycological branch research is done on the fungus diseases of living trees as well as on destructive fungi and the damage they cause to wood products. The task of chief importance is to discover means and methods to prevent or counteract the damage done by these fungi. Extensive investigations are in progress in connection with Phacidium blight, *Phacidium infestans*, a form of fungus which, particularly in the higher latitudes or northern Sweden, gives rise to considerable damage in young pine stands. Similarly, a profound study is being made of the various diseases of a mycological origin which cause havoc in new plantations. Pine blister rust, *Cronatium asclepiadeum*, occurs in all parts of Sweden as a harmful influence in pine forests. Spruce are attacked to a much greater extent than pines by rot fungus of which heartrot or rootrot, *Polyporus annosus*, sometimes causes serious damage in pine forests. *C. asclepiadeum* and the various other forms of fungi which produce decay in pine trees [illegible] comprehensively investigated.

Material amounting to millions of crowns in value is ruined annually in Sweden through forest products, the chief of which are timber and wood pulp, being attacked by fungus diseases during the period of transport to the woodworking industries and storage at the point of use. Intense research work is in progress, however, to discover prophylactic or direct methods for counteracting this damage. Since it is suspected that fungus infections are transmitted by insects in some instances, as for example in the case of discoloring, the investigations are being conducted in collaboration with the zoological division.

In recent years antibiotic countermeasures have rightly attracted some attention in the fight against diseases caused by microorganisms. In forest trees, too, substances with an antibiotic effect are produced which possess the character of natural root fungi poisons. Two phenolic substances have been isolated

A soil-analysis laboratory.

from the heartwood of pine which exercise such poisoning effects. In this field of research, which opens up unsuspected aspects in the fight against wood-destructive microorganisms, investigations are carried on in collaboration with the Royal Technical High School's Institution for Organic Chemistry.

Genetical Division

For many years past genetic research has been carried out on a certain scale by the Forest Research Institute. In amplification of the reorganization undertaken in 1944, genetic research was transferred to an independent division in 1946, in order to carry on the work in a far more intensive way than was hitherto possible. Its primary purpose is to improve the culture of forest trees, preferably by selective methods.

Attention has already been drawn to the fact that very extensive forest cultivation must be undertaken to ensure the future of wood production in Sweden. According to a survey made by the Forest Research Institute, a forest area of some 100,000 hectares must be planted annually with approximately 60 tons of seed. The heavy costs of restoration, the greater part of which are due to manual work, make it highly desirable that genetically sound seed be employed. Only by this means can satisfactory cultivation be assured and a firm foundation laid for a future production of high quality and quantity on the stand cul-

tivated. In selecting the seed for forest restoration work, and considering the possibilities of transplanting pine and spruce seed from one district to another, it is anticipated that the provenance research carried out by the Institute will offer valuable guidance. As already mentioned, the difficulties of reforestation are particularly marked in northern Sweden. This is due, among other things, to the fact that good seed years occur in this district at longer intervals than in the southern and central parts of the country. It is a matter of importance, therefore, to be able to determine in a horizontal and vertical direction the limits within which forest seed may be planted without risking the result. Provenance research also seeks to ascertain whether, by planting seed between districts with different climatic conditions, it is possible to improve the production in comparison with seed produced in the locality itself.

The possibilities of increasing forest production quantitatively have aroused great interest in Swedish forestry circles. During recent decades great efforts have also been made to improve the quality of production and therefore the value of the output. With this end in view, trees of the poorest quality have been cut down systemically during thinning, and as far as possible those trees have been left standing which, judging by their external appearance, have the most valuable properties of quality and growth. In order to obtain seed of good quality the systematic plan has been followed of allowing the finest trees to remain as seed trees when clearing a stand. When planting out pine or spruce seedlings, the practice has been adopted in recent years of selecting the fastest-growing and qualitatively best plants from the available material and rejecting the inferior plants.

By combining genetic research with the more practical forms of improved culture, it is believed that rapid and appreciable gains will become available. In this connection, research work is being directed towards an inventory of Swedish forests, more particularly with respect to the value of different types of stands and trees, and their properties are being carefully studied. The extensive material accumulated by the Forestry Division from closely investigated and described sample plots will provide a valuable starting point.

The subsequent task of this research work will be to find an answer to the question: What actual influence does the genetic structure of a forest tree exercise upon the productive conditions of the stand? The properties of the tree can always be traced back to the influences of both heredity and environment. As previously mentioned, the mathematical-statistical work carried out with the observation data obtained from the Institute's sample plots, in conjunction with production investigations, affords certain possibilities of separating these influences from one another. It may be taken as a reasonable working hypothesis that the properties of a given distinct type of tree, which cannot primarily be attributed to any known kind of environment, is the result of the genetic constitution. Future research must specially consider whether the properties of parent trees of various types are inherited by the offspring. Investigations are being planned in collaboration with the Institute's entomological and mycological workers to ascertain whether any races or types of trees exist, or can be produced by crossing, which are capable of resisting parasitic fungi and injurious insects.

Zoological Division

Owing to their great variety of species and profusion of numbers, insects constitute the major element among forest fauna. For this reason and because insects play a far more important economic role than other forms of animal life, the Zoological Division is mainly engaged on problems associated with the occurrence of and damage done by these insects.

The nature of the damage insects cause in the forest varies considerably; certain species attack and consume foliage, while others burrow under the bark or into the wood. The damage done sometimes causes the death of the tree or it may result in a reduction of its vital functions, with a consequent decrease in growth or the production of defective qualities.

Other insects attack sickly trees, either fallen or standing; such types, from man's point of view, are relatively harmless under normal conditions. In the event of wholesale multiplication, however, as after storms, forest fires, etc., they may constitute a serious menace and attack and kill healthy trees.

Swedish insect fauna include relatively few species that are helpful from the forester's point of view. Among these may be reckoned parasitic and predatory insects which attack the injurious insects themselves. Insects that accelerate the decomposition of the soil cover are likewise helpful to forestry.

One of the most important tasks of the Zoological Division is to add to our knowledge relating to the biology of injurious insects and to work out means of controlling them. Greatest attention has been devoted in the past to our most troublesome species of bark-beetles, *Blastophagus piniperda* and *Ips typographus*. As a result of this work information of value to practical forestry can be obtained on suitable methods of control. An intimate knowledge of the biology of injurious insects is important because it provides data on the stage of development in which a certain species of insect offers the least resistance and can therefore be combated most successfully. Thus it is possible in many instances to reduce or eliminate the damage caused by a given type of insect without resort to expensive measures.

The division also plans suitable methods for estimating the frequency of occurrence of injurious insects and the amount of the damage they cause, as a basis for judging the extent of the control measures required.

The relation between certain injurious insects and fungi likewise forms a subject of investigation in collaboration with the Institute's mycololgical experts. Here attention mainly directed towards ascertaining the connection between discoloration of wood caused by blue-staining fungi and insects that attack felled timber.

The program likewise includes investigations relating to animal life in the forests, the purpose of which is to increase our knowledge of the insect fauna occurring in the soil and the part they play in the processes taking place in the soil as well as in reforestation.

In recent years the contact poison DDT has been produced which exercises a nerve-paralyzing effect on insects and which, judging by results, offers a valuable means of combating injurious insects. The Zoo-

logical Division has been investigating the possibilities of controlling forest insects by dusting DDT powder from airplanes or helicopters, with very promising results.

This is a brief account of the Forest Research Institute—the official body for Swedish forest research—its organization and more important work. The solution of the problems concerned call for close cooperation among the divisions and subsections of the Institute—between basic research and applied research—and also in many cases with other scientific institutions and the practical side of forestry. The main object of the Forest Research Institute's activities is to afford guidance to the forester in the management of our great natural resource, the Swedish forests.

Dusting severely insect-damaged forest with DDT powder from a helicopter.

Photos accompanying this article were furnished by courtesy of the Forest Research Institute of Sweden.

Forestry In Iraq

By G. W. CHAPMAN

THE natural forests of Iraq are confined almost entirely to the northeast region of the country, in mountains occupied by Kurdish tribes. Here the forests clothe the mountain ranges, while the intervening valleys are mostly given up to cultivation or to grazing. Outside the mountain areas, forests exist only as small patches of river-bank scrub (*akhrash*) along the Euphrates and Tigris and their main tributaries. The remainder of the country is treeless.

The mountain forests have not yet been surveyed or delimited, so that their exact area is unknown. It is estimated that their area is around 20,000 km^2, which is roughly two-thirds of the total mountain area in the Northeast region. About 50 percent of the mountain forests are of good stock and may be regarded as productive forests; the remainder represents degraded scrub with a sparse stock of bushes, or cutover forests not likely to become exploitable within the present generation. The lowland riverine forests have for the most part been surveyed during the course of land settlement and their total area is stated to be 80,538 *donums*, or a little over 200 km.^{2}

Oak trees form the main species of the mountain forests. *Quercus brantii* (*balut*) has the widest range, with *Q. infectoria* commonly admixed, occurring more frequently on the more favorable sites. *Q. libani* (*dindar*) is found in the northern mountains above 1,500 meters elevation. The following tree species are found commonly mixed with the oak trees: *Juniperus oxycedrus, Pistacia mutica, Pyrus syriaca, Crataegus azarolus* and *P. monagyna, Acer monspessulanum.* Along mountain stream banks willows, *Salix purpurea* and *S. medemii*, plane, *Platanus orientalis*, popular, *Populus euphraca*, and ash, *Fraxinus rotundifolia*, occur and in some places wild groves of walnut, *Juglans regia. Pinus brutia* occurs mixed with the oak forest in a restricted area of about 500 km^2 in the Zawita-Atrush district of Mosul Liwa, and apart from the more widely occurring juniper represents the only coniferous forest found in Iraq.

The main species in the lowland forests are species of willow (*Salix purpurea* predominating in the northern parts and *S. alba* and *S. acmophylila* occurring in the south), *Populus euphratica*, and different species of *Tamarix*, the trees often forming thickets with brambles and creepers of such density as to be impenetrable except to the wild pigs which occupy these forests.

All forests in Iraq are used by the people for the production of firewood and charcoal. Villagers close to forest areas cut their own domestic supplies, while along the main road running through the mountains there has been heavy cutting in recent years to supply charcoal and wood to the urban markets of the plains. Many of the forests most accessible to these markets

have been so heavily cut over that they have been rendered unproductive for many decades to come. It is estimated that the total yield from the forests annually is about 10,000 tons of charcoal and 20,000 tons of wood fuel, involving the felling of about 2,000 hectares of mature forest every year. This yield is thought to be well within the capacity of the forests to supply, so long as a systematic program of forest road construction is carried out to enable forest areas at present inaccessible to be brought under economic exploitation.

The oak trees attain a height of 30 meters and a diameter of 25 centimeters at maturity and on favorable sites exceed these dimensions, though rarely producing boles long or straight enough to produce sawtimber of commercial sizes. However, oak trunks are frequently used for pillars or rafters in village huts, while the branches are used very extensively for covering the roofs and for the construction of summertime dwellings (*kapras*). Overmature oak trees are almost always attacked by heartrot, so that, generally speaking, the main value of these forests is for the fuel they can produce. It is proposed to develop the oak forests in future on a system of selective coppicing, with a utilization diameter of 10 to 15 cms, which would be attained by a rotation of 50 years.

With few exceptions all forest areas in the country are grazed over by flocks of sheep and goats and by herds of the hardy native Kurdish cattle. In many areas the villagers have the habit of pollarding the oak forest in a three-year rotation for the supply of foliage, used in winter as cattle fodder. In such areas, the villagers are careful to preserve the forests, for without them it would be impossible to provide sustenance for the flocks during winter when deep snow covers the ground. The forests, therefore, have an important function in relation to the animal husbandry industry, and it is important to safeguard this function in their future development. In the high mountains, the forest zone reaches as far as the 2,000-meter contour, above which lie the summer pastures, extensively grazed by the nomadic Kurdish tribes. It is estimated that these high pastures occupy about 2,000 km². of the total forest area, and though they must remain predominantly grazing lands, such areas offer a high potential for afforestation of species of timber trees suitable to high elevations. It is also mainly in these areas that the tragacanth gum-producing species of *Astragalus* occur.

In addition to the forest products already mentioned there are several secondary products of some importance. Gallnuts produced by *Quercus infectoria* are harvested in considerable quantity for tanning and are exported. In 1938 the value of this export item amounted to ID. 41,569 (about $203,000). The gum tragacanth sells for about ID. 1,200 (about $5,900) a ton locally, and quantities valued at about ID. 50,000 ($240,000) are exported annually. Acorns are collected and sold locally, and in times of poor harvests these are ground into flour and used extensively by the villagers. The seeds of the *Pistacia mutica* are also widely used.

Afforestation

Iraq produces very little timber, so that most of the requirements, especially in constructional timber and high-grade furniture wood, have to be imported. In 1938, the value of timber imports amounted to ID. 440,000 ($2,150,000) so it is evident that afforestation is needed in order to increase local production and to save import costs. Apart from a small amount of locally grown plane and walnut, most of the local timber consists of poplar, *Populus nigra*, which is cultivated by the villagers on irrigated plantations in the northern mountains. Owing to the intense demand, it is the custom to fell the poplar groves before the trees have attained timber dimensions for the supply of roofing poles and for rough construction work. The annual yield from these poplar groves is not known, but it is a profitable industry and one capable of considerable extension under private enterprise. Research is being undertaken by the Forest Section into methods of improving the methods of cultivation, aiming at improvement of quality and yield per *donum*. Mulberry, *Morus alba*, is also grown on irrigated plantations in many parts of the country, mainly for the sake of the fruit, but the trees also yield a useful supply of low-grade timber. Apart from these two instances, little attempt has been made to establish plantations of trees for timber or fuel, though useful experimental plantations have been established by the Department of Agriculture at Zafraniya and Abu Gharaib to try out various species of exotics.

It is the intention of the Government, as part of its forestry development program, to establish more extensive plantations to increase the supply of sawtimber, especially of softwoods for construction work, sleepers, and for box-shooks (for the date-packing industry), to augment the supply of fuel and light poles required in rural areas, and as preventative measures against wind and water erosion. A series of small-scale reafforestation projects have been started by the Forest Section in order to obtain data as to the best methods and the most suitable species for the establishment of new forests under a wide range of varying soil, climatic, and topographic conditions. It is realized that an increased production of all timber products is essential for the achievement of a higher standard of living for the people, especially in the rural areas.

In establishing these new forests, exotic species will play an important role, in addition to a wider cultivation of useful indigenous trees such as the walnut, plane, ash, mulberry, and pine. The most promising exotics under trial are:

High mountain areas: Pinus caramanica, Cedrus libani, C. deodora, Abies cillicica, Betula alba, Robinia, and poplars.

Medium mountain areas: Pinus halepensis (and *P. brutia* of local origin), *Robinia, Alnus orientalis, Pinus pinea* and *P. canariensis, Cupressus sempervirens.*

Low mountains and rain-land plains: Pinus halepensis, P. pinea, Cupressus sempervirens, Acacia cyanophylla, Alnus prientalis, Populus alba, Eucalyptus rostrata, E. coolabah and *E. gomphocephalus, Melia azedorach, Thuja orientalis.*

Lowland irrigated plains: Eucalyptus species as above, *Acacia cyanophylla* and *A. farnesiana, Tamarix articulata,* etc.

Plant Nurseries

There is a constant and increasing demand for tree seedlings which existing plant nurseries find it difficult to supply. Large nurseries are maintained at Zafraniya near Bagdad and at Nineveh near Mosul, as well as many other small nurseries scattered over the country. These nurseries are not devoted entirely to the production of tree-seedlings but supply a great variety of fruit-tree, vegetable, and flower seedlings, but it is the intention of the Government to establish large forest seedling nurseries in different parts of the country to supply the needs not only of private plantation work but to provide for the new afforestation plans under development by the Forest Section. The establishment of the first two forest nurseries at Shaqlawa and Arbil are under active consideration by the Government.

Forest Protection

The natural forests of Iraq are of importance no less for their outturn of useful products than for the protection of the mountainsides against the forces of erosion and in checking the runoff of winter rains and snow-melt. The river floods coming down the Tigris in spring are of vital importance to the country, in one sense because of their irrigation value and in another because of the danger of the floods getting out of control and causing great damage by inundation. The mountain forests forming the catchment areas of the Tigris and its principal tributaries exercise a most important function in flood control and in reducing the silting up of river beds, reservoirs, and irrigation canals. It is very necessary, therefore, to maintain and to improve forest cover in the mountains so that its function in relation to flood control and erosion should not be further impaired.

Uncontrolled or badly regulated cutting of the forest is at present a prevalent form of damage, especially in areas within economic exploitation of the urban markets. With an ever-growing population there is also considerable pressure on the forest land by cultivators, and a tendency has been noticed for temporary cultivation to encroach upon cutover forest, which prevents recovery of the forest after cutting, and leads to accelerated soil erosion and runoff. Fire in summer is widespread in the mountain forests and imposes annually a loss on the forests which must exceed the loss by cutting. Grazing is another form of forest exploitation which, if uncontrolled, can do great harm, especially in burned- or cut-over areas, where the constant browsing and trampling of the flocks tend to retard forest recovery and to increase the rate of erosion. These four destructive agencies—cutting, shifting cultivation, forest fires, and grazing—all the work of man—far outweigh in importance the damage by natural causes, such as fungal decay, insect attack, grazing by wild animals, climatic accidents, etc.

In order to obtain a proper degree of forest protection, three things are essential:

a. Adequate forest laws,
b. The systematic delimitation of forest areas within which forest law may be applied, and
c. An adequate staff of trained foresters.

The present forest law in Iraq was promulgated long ago and is no longer adequate for modern conditions. A new ordinance has been drafted and will shortly be enacted. The draft law provides for the regulated control of all forms of forest exploitation under permit, for the prevention of damage, and creates conditions under which existing forests can be developed and new forests created. Under this law, forest areas will be properly demarcated and divided into state forests and village forests, the latter being managed especially in the interests of the villages particularly concerned and in which the village authorities will be encouraged to take over in large measure their protection and development.

The demarcation of the forests presents a difficulty insofar as cadastral surveys and land settlement have not yet reached the mountains in which most of the forests occur. It is the intention of the Government to push ahead with forest surveys, if necessary in advance of land settlement, and with this object in view a project for an aerial survey of about 3,000 km^2. of the mountain forests is now under consideration. The Forest Section is also recruiting staff in preparation for the demarcation of forests. As each forest unit area is demarcated it will be manned by forest staff and the law can then be applied in full to that section. It is hoped that forest demarcation work will be completed in about ten years, and, as the work progresses, intensive forest protection will be applied.

The Forest Section of the Agriculture Department was established a few years ago and is gradually gaining in strength and experience. The Government has embarked on a program of training forest officers at foreign universities, and selected subordinate staff will shortly be sent overseas on training courses, to augment the elementary training gained locally. It must be admitted, however, that the existing forest staff is inadequate, both in number and caliber, for the tasks awaiting it when the new forest law is promulgated and intensive forest protection, as well as new programs of afforestation, add new and untried burdens. For this reason the Government has decided to recruit a number of foreign foresters to strengthen the Iraqi forest staff until such time as suitable numbers can be trained.

In the meantime, the supply of firewood and charcoal from the forests must continue to meet local demands, and the problem of arranging this supply in a manner less harmful to the forests is a matter of the greatest present urgency. Among other schemes suggested for securing better control of the cutting, one is under consideration envisaging a kind of Government monopoly for the extraction and wholesale distribution of firewood and charcoal in the main urban markets. This scheme presents certain administrative difficulties and may not prove feasible in operation. But whatever method is finally adopted, this problem remains the first and most urgent need in applying forest protection.

Commodity Reports

Europe's Timber Problem

It is now twelve months since FAO published a special issue of UNASYLVA *devoted to the Marianske Lazne Timber Conference of 1947 and to European forestry and timber problems.*

The following article sums up in general form the developments in the timber situation since that time. It was prepared by the Research and Planning Division of the United Nations Economic Commission for Europe, in co-operation with the staff of FAO's European Forestry Working Group.

AMONG the factors delaying economic reconstruction in postwar Europe, the timber shortage is still one of the most important. Inadequate supply of timber is limiting the execution of building programs to meet the huge deficit in housing caused by war devastation and by the discontinuing of new construction during the war. Besides the human and social problems directly involved, this also means that industrial productivity is kept down. In many cases industrial investments are dependent on the possibilities of furnishing adequate workers' dwellings. Apart from construction, which is by far the most important use of timber, an adequate supply of pitprops and railway sleepers is essential to the development of coal production and to the reconstruction of the transport system. In both cases the dependence is mutual: just as coal production and railway transport depend on the supply of timber, the timber output is adversely affected by the shortage of coal and coke, which means that manpower has to be diverted to the cutting of fuelwood, while in some important cases timber production is being held up because of a shortage of transport facilities.

Unlike the shortages of some other important commodities such as coal and steel, the European timber shortage is likely to make itself felt over a rather long range of years to come.

An attempt is made in this article to give a survey of the more important facts and tendencies determining the present and future timber situation in Europe, and of the activities undertaken by FAO and the Economic Commission for Europe towards solving some of the short- and long-term timber problems through international co-operation.

Shifts in the Production and Trade Pattern

In Table 1 a broad comparison is made between Europe's prewar and postwar production and trade in timber.

In prewar years net imports of softwood lumber to Europe (including the U.S.S.R.) amounted to only a few percent of total consumption. Since, at the same time, there was a net export of pulp from Europe representing a somewhat greater amount of roundwood, it could be said that Europe's wood requirements were more than met by its own resources.

The main feature of the postwar situation is that the output of timber in Europe (outside the U.S.S.R.) has fallen appreciably while net imports from the U.S.S.R. and non-European sources taken together have been reduced to about 30 percent of the prewar amounts. The decrease in home production is apparent chiefly in the exporting countries, while some of the countries dependent on imports show a marked increase.

The decline in total availabilities for Europe as a whole, at a time when demand for timber is steeply rising, has, moreover, been accompanied by a complete change in the trade pattern. Above all, exports from the U.S.S.R. (which before the war accounted for almost one-third of the total exports of European countries) have virtually stopped, and exports from other eastern European countries have been greatly reduced. Also, the northern timber-exporting countries, which were not—or only to a lesser degree—devastated by the war, have reserved a larger share of a smaller output for home consumption.

The result of this steep decline in exports has been a very uneven distribution of available supplies of timber between the exporting and importing countries. The last column in Table 1 shows that the reduction in total timber availabilities against prewar supplies was about 30 percent for Europe (outside the U.S.S.R.). The importing countries, however, in some cases got only 60 percent of their prewar supply, while timber consumption in some exporting countries was well above the prewar level. This does not mean, however, that even in these latter countries, the postwar supply of timber has been adequate to meet essential needs. Among the exporting countries are some which, before the war, had an abnormally low consumption of timber and which now have abnormally high requirements owing to war devastation.

These few facts should suffice to show that Europe's timber shortage is of such dimensions that the problem must be attacked simultaneously from all sides. On the supply side there is the problem of stimulating

output in the forests, of ensuring that full use is made of the roundwood which could go into timber production, and finally the problem of filling a part of the gap by increased supplies from overseas. On the demand side there is, first of all, the problem of economies in the conversion and use of timber, and, secondly, of furthering a more fair and economical distribution of the available supplies among the European countries.

The Possibilities of Increased Supplies

Europe's Forest Resources

For many years before the war the yield from European forests appeared to be declining. This was particularly true of Poland, Czechoslovakia, Yugoslavia, Rumania, and the Baltic republics.

The war greatly accelerated this deterioration, partly by the direct devastation of forests, sawmills, and factories for wood conversion, and—much more important—through heavy overcutting. The most serious damage of this nature seems to have occurred in Poland, under the German occupation. In Germany itself annual cuts are estimated to have been about 150 percent of annual growth since 1935. Among the important surplus areas, only the northern countries managed to get through the war without serious damage to their forest capital.[1]

In view of this drain on Europe's forest resources, it is out of the question to fill completely the present shortfall in Europe's timber supply by increased fellings in areas already under exploitation. On the contrary, timber output will have to be reduced in the near future if further serious damage to the standing resources is to be avoided. In view of the present extreme timber shortage, some overcutting may still be deemed permissible, and international agreements about such extra production have been made. It is, however, clear that emergency measures should be strictly limited in time and should be made good by reduced felling at a later stage, by planting, and by the introduction of more efficient silvicultural practices in existing forests.

The only way, then, to meet Europe's needs from nearby sources might appear to be the opening up of still unexploited forests. But the forests of most European countries are already under some system of forest management, and the European forests of the U.S.S.R. are being worked to capacity and maybe beyond to meet the huge postwar reconstruction program in the Soviet Union. The vast areas of untouched forest in the U.S.S.R. lie mostly in Asia and their development would be a major operation involving shifts in population and heavy capital investment, including large-scale construction of new ports, roads, and railways. Increased amounts of timber from these sources could scarcely be expected to reach the market under three to five years from the begining of such an undertaking. However, it does seem quite clear that the attainment of a balanced timber economy for Europe as a whole depends upon the Soviet Union reentering the western timber market on the prewar scale.

Obstacles to Production

Manpower. So far the prospective European output of timber has been discussed from the standpoint of the limits set by available forest resources, and by the necessity of avoiding further deterioration of these resources. There have been other serious obstacles to maximum production of timber since the war.

The main difficulties have been in the fields of manpower, logging and transport equipment, and sawmill rehabilitation. Furthermore, the amount of wood available in the form of timber has been restricted by

[1]For more detailed information, see *Forestry and Forest Products, World Situation 1937-46*, and "Forest Resources of the World," UNASYLVA, Vol. II, No. 4.

Table 1.—Output, Trade, and Consumption of Sawn Softwood*
(*1,000 standards*)

	1937			1947			Consumption 1947 as a percentage of 1937
	Output	Net imports or exports (—)	Available for consumption	Output	Net imports or exports (—)	Available for consumption	
British Isles	79	2,446	2,525	78	1,440	1,518	60
Western Europe[1]	586	933	1,519	785	574	1,359	90
Germany[2]	1,084	731	1,815	1,132	—616	516	
Central and Southern European countries (importing)[3]	381	620	1,001	533	206	739	75
Norway	358	— 51	307	275	— 50	225	75
Sweden	1,557	— 820	737	1,200	—409	791	105
Finland	1,330	—1,045	285	710	—474	236	85
Central and Southern European countries (exporting)[4]	2,935	—1,377	1,558	1,937	—319	1,618	105
Total Europe excluding U.S.S.R.	8,310	1,437	9,747	6,650	352	7,002	70
U.S.S.R.	7,250	—1,362	5,888	[5]6,000	[5]— 30	[5]5,970	
Total Europe	15,560	75	15,635	12,650	322	12,972	

[1]Belgium, Luxembourg, Netherlands, France, Denmark.
[2]Three Western Zones only.
[3]Switzerland, Hungary, Italy, Greece, Turkey.
[4]Yugoslavia, Rumania, Bulgaria, Poland, Czechoslovakia, Austria, Portugal.
[5]Estimate.
*Data for trade include the sawn lumber equivalent of sawlogs.
Source: FAO/ECE Timber Statistics 1946-47, revised by FAO.

the fuel shortage and by the competition of the pulp industry.

Especially in the northern countries, the shortage of manpower has been the most important limiting factor in timber production since the war. It is not surprising that, under conditions of a general labor shortage, the scarcity is most acute in occupations which require heavy physical labor and often a dull life in remote forests. In some countries (for instance, Austria and Finland), lack of consumer goods has also hindered the recruitment of forest workers, who require a diet of high caloric value and strong and warm clothing. In other countries, for instance Czechoslovakia, the displacement of population after the war has contributed to the shortage of manpower for lumbering. The seasonal variations in forest work also add to manpower difficulties at a time like the present, when steady employment in other trades can easily be obtained. The concentration of silvicultural work and forest-tending in the off-season between felling operations may help somewhat toward securing steady employment during the whole year for a large number of skilled forest workers.

The general shortage of manpower has, as is well known, led to important shifts in relative wages in favor of the heavier and more unpleasant occupations. There has been a general rise in wage levels for forestry relative to town occupations. It seems, however, that even considerable wage increases are not very effective in easing the manpower shortage in the less attractive industries, at least as far as the recruitment of young workers is concerned. The analogy between the manpower problem in the Scandinavian forests and in the British coal-mining industry is obvious. In Norway, for instance, there is an acute shortage of manpower in the forests, though wages in forestry have risen threefold compared with the prewar level, while industrial wages have only doubled.

Equipment. The shortage of equipment is closely bound up with that of manpower. The introduction of technical innnovations, both in felling and transport in the forests (for instance, the substitution of mechanical saws for handsaws and the use of tractors, cableways, and suitable sledges) would ease the manpower shortage, both by raising the productivity of labor and by making lumbering a less arduous and therefore more attractive occupation.

There are also great possibilities for technical improvement in the sawmills, by which both labor and raw materials could be saved. It has, for instance, been estimated that in some countries the use of thinner saw blades could raise timber production of individual mills by as much as 10 percent. Even in more technically advanced countries such as Sweden, the introduction of new mechanical equipment (for instance, in the drying process and for transport) has made possible very considerable economies in labor. The general shortage of manpower and the rise in wages should, of course, serve as a stimulus to the adoption of new methods.

Quite apart from the need for technical improvevent, there is a great need, in most producing countries, for ordinary logging and sawmill equipment, owing to wartime destruction or lack of maintenance. It may be that in the U.S.S.R. the provision of equipment would prove an important factor in the raising of production. In the Anglo-Soviet trade agreement concluded in December 1947, substantial exports of timber equipment to the U.S.S.R. were arranged; Sweden has also contracted to sell such equipment to the Soviet Union. In the Paris report of the CEEC countries their import requirements for logging (including transport) and sawmill equipment were estimated at $80 million for the years 1948-51, of which $57 million was to come from the United States. As the result of price rises in the more urgently needed goods, the purchase of timber equipment has had to be given decreasing priority, and American deliveries are unlikely to be of any great magnitude.

However, the whole problem of modernizing and mechanizing forest industries is getting increasing attention both in Europe and in America. There is a great need for international co-operation in this field, both in overcoming foreign exchange difficulties, which hinder some countries from importing modern equipment (thereby increasing their export availabilities of timber), and in spreading knowledge about experiments being made with new technical methods. The FAO/ECE European Timber Committee has as one of its foremost tasks to assist producing countries in procuring equipment whereby production and export of timber can be increased.

Transport

The need for new equipment is especially acute in the field of transport. Railway track and lorries have been destroyed or worn out, and in some countries there is a severe lack of horses and fodder. There are, therefore, many instances of felled timber being left in the woods on account of the lack of transport. These difficulties have been aggravated by the fact that in some countries the overcutting under German occupation was most serious in the more accessible stands, near rivers and other good transport routes. To extend intensive exploitation to the remoter forest areas of central and southeastern Europe, which might be profitable at the present high prices of timber, would require increased supplies of transport equipment, sometimes of a specialized kind.

Competition with Other Wood Products

Apart from the limitation set by the quantities it is possible to cut and transport, there is also, at the next stage of production, the problem of competitive uses for wood.

In prewar years fuelwood accounted for some 42 percent of total cut in Europe (excluding the U.S.S.R.). The shortage of coal and petrol during and after the war has necessitated an increase in the production of fuelwood, up to about 50 percent of the total cut. This has been a serious check to timber production because it absorbed manpower and transport facilities.

As mentioned below, action has been taken by ECE to divert extra amounts of coke to countries which can then reduce the cutting of fuelwood and so increase timber exports, and on the whole there is reason to expect that the production of fuelwood will gradually return to a more normal level as Europe's coal supplies increase.

The same cannot be said of pulp, the other main use of wood competing with lumber. For some decades there has been a steady rise in the production of pulp, because of increasing consumption of paper (especially for packing) and in later years the de-

velopment of rayon and other synthetic materials derived from pulp. It has been estimated that before the war pulpwood accounted for some 15 percent of the total cut in Europe (excluding the U.S.S.R.).

Table 2 shows production, exports, and consumption of pulp and paper for the three Scandinavian countries, which before the war accounted for 60 percent of pulp production in Europe outside the Soviet Union. It is seen that the relative reduction in the output of sawn goods and of pulp compared with the prewar situation is about the same, that exports in both cases have declined more than production, so that relatively larger quantities have been available for consumption in the home market, and, finally, that exports of pulp have undergone a far greater reduction than exports of paper.

In Table 3 an attempt has been made to assess production and trade in pulp and paper for Europe as a whole. According to these figures, total production of pulp in 1947 was down to 57 percent of the corresponding amount in 1937, and total exports of pulp and paper from European countries had declined slightly more. It is further seen that as far as intra-European trade is concerned, the reduction of exports of pulp and pulp manufactures is about the same. This is because the tendency in pulp-producing countries to export paper rather than pulp is balanced by the curtailment of paper exports from countries dependent on import of pulp. As regards exports to overseas countries, on the other hand, the shift towards exporting the commodities in a more advanced stage of manufacture is very marked, pulp exports having declined to 49 percent of prewar against 64 percent for paper.

Total consumption of paper and paperboard is estimated to have been 5.4 million tons in 1947, or about 60 percent of 1937 consumption. This figure includes estimates for German production and trade. If Germany is left out of account, it appears (see Table 4) that consumption of paper in 1947 was about 70 percent of prewar. For the same area (Europe excluding the U.S.S.R. and Germany) the consumption of sawn softwood was about 80 percent of prewar. Just as in the case of timber, the postwar level of paper consumption shows rather striking differences from country to country. While the northern producing countries in 1947 consumed much more paper than before the war, the countries dependent on import of pulp and paper have in most cases reduced consumption drastically. This applies above all to the United Kingdom, normally by far the greatest paper-consuming country in Europe.

There is no easy method for determining how far the actual allocation of wood resources between timber and pulp is rational from the standpoint of European reconstruction. It is, however, evident that there are strong incentives for both manufacturers

TABLE 2. PRODUCTION, EXPORTS, AND CONSUMPTION OF LUMBER, PULP, AND PAPER
Norway, Sweden, and Finland

Sawn Softwood (million standards, including box-boards)	1937	1947	1947 as percentage of 1937
1. Production	3.2	2.2	69
2. Exports	1.9	0.9	47
3. Apparent home consumption (1 — 2)	1.3	1.3	100
Pulp, paper and paper board (million tons)			
4. Production of pulp	6.8	4.9	72
5. Exports of pulp	4.7	2.8	60
6. Exports of paper and paper board	1.6	1.4	88
7. Total exports of pulp and pulp products (5 + 6) (ton for ton)	6.3	4.2	67
8. Apparent home consumption (4 — 7)	0.5	0.7	140

SOURCE: Research and Planning Division, Economic Commission for Europe.

TABLE 3.—WOOD PULP AND PULP PRODUCTS
Europe (excluding U.S.S.R.)

	Wood pulp			Paper and paper board			Wood pulp, paper and paper board (ton for ton)		
	1937	1947	1947 as percentage of 1937	1937	1947	1947 as percentage of 1937	1937	1947	1947 as percentage of 1937
	(*1,000 metric tons*)			(*1,000 metric tons*)			(*1,000 metric tons*)		
1. Production of wood pulp	12,100	6,950	57	—	—	—	—	—	—
2. Intra European Trade	3,270	1,720	53	1,650	930	56	4,920	2,650	54
3. Exports to Overseas	1,980	970	49	1,500	965	64	3,480	1,935	56
4. Imports from Overseas	130	185	142	410	200	49	540	385	71
5. Net exports to Overseas (3 — 4)	1,850	785	42	1,090	765	70	2,940	1,550	53
6. Apparent Consumption of paper and paper board[1]			—	9,160	5,400	59	—		

SOURCE: Research and Planning Division, Economic Commission for Europe.
[1]Production of pulp *less* net exports of pulp, paper and boards (ton for ton).

TABLE 4.—CONSUMPTION OF SAWN GOODS AND PULP PRODUCTS

	Sawn softwood			Paper and paper boards		
	1937 (*1,000 standards*)	1947	1947 as a percentage of 1937	1937 (*1,000 metric tons*)	1947	1947 as a percentage of 1937
United Kingdom	2,440	1,490	61	3,100	1,280	41
Continental Europe excluding Germany and U.S.S.R.)	5,400	5,100	94	4,110	3,680	90
TOTALS AND AVERAGES	7,840	6,590	84	7,210	4,960	69

SOURCE: Research and Planning Division, Economic Commission for Europe.

and the authorities in producing countries to favor the allocation of wood resources to pulpmills rather than to sawmills. Though the rise in prices compared with prewar is very nearly the same for timber, pulp, and paper,[2] the fact that pulpmills represent comparatively more fixed capital than sawmills make it advantageous to allocate raw material to them rather than the sawmills, since some capacity must in any case lie idle under declining forest output. Still more important perhaps is the fact that both pulp and paper are in great demand in hard-currency countries.

Although there has been in recent months a decline in the prices obtained for European pulp in America, it still seems probable that there will be a tendency toward increasing export of pulp and paper in this direction. This is being achieved, partly by curtailment of paper consumption in the producing countries themselves (Sweden is an example of this), partly perhaps also by a decrease in exports to other European countries. In so far, however, as increased pulp and paper exports to America is an alternative to increased timber distribution within Europe, it may well be questioned whether this method of increasing Europe's dollar resources is desirable, in view of the over-all shortage of timber for construction work.

Timber Imports from non-European Sources

There is little or no prospect of the gap in Europe's timber supply being filled by increased imports from the Western Hemisphere. Both in the United States and in Canada, home demand for forest products is at record levels because of construction requirements, backed by a high level of national income and a rising consumption of paper. Furthermore, it is being increasingly emphasized that the heavy and uncontrolled overcutting which has taken place in the United States over many years will make it imperative to reduce annual fellings below prewar levels. This would make the United States more dependent on the Canadian forests, from which Europe's greatest timber importer, the United Kingdom, has heretofore purchased a major part of its supplies.

Even if they were possible, however, increased imports from North America would be a heavy liability on the strained dollar resources of European countries and are not likely to be sought.

Apart from North America, the only possibility of increased imports of timber to Europe would seem to be expanded output from softwood forests in Brazil. This, however, again involves vast problems of equipment, transport, and organization and can at best be achieved over a long period of years.

Real Needs and "Effective Demand" for Timber

In June 1948 the FAO/ECE European Timber Committee estimated the effective demand for sawn softwood of importing European countries to be about three million standards. This figure represents what the importing countries, in view of their currency position, considered the maximum amount they would be able to buy in 1948 and is not very much above the prospective availabilities from the exporting countries.

This effective demand is only 57 percent of actual imports in 1937, but even this comparison understates the present timber shortage since real needs, above all for construction, which normally accounts for about 60 percent of total timber consumption, have vastly increased because of postwar reconstruction and population movements.

It is not possible to make a quantitative estimate of the potential demand represented by total "real needs." For even if timber were abundant, other factors (notably lack of manpower in the building industry) would set strict limits to the reconstruction of Europe's housing. But some figures on postwar building programs and building needs might give an idea of the order of magnitude of the problem.

The Housing subcommittee of the ECE has made an attempt to assess the needs and programs in the field of house construction for those European countries for which detailed data were available. This investigation covers 14 countries, which represent about 45 percent of total European population. Among the countries not included in the calculations are the U.S.S.R., Germany, and other countries known to have undergone vast destruction during the war. The figures given below cannot, therefore, be regarded as representative of the situation for Europe as a whole.

For this sample of 14 countries, the prewar production of houses, the planned production for 1948, and annual production necessary to overcome the present housing shortage are set out as follows:

	Volume of construction 14 European countries *(1,000 dwelling units)*
Prewar, annually	600
Planned for 1948	660
"Necessary Program" 1948-52, annually	1,600–1,700
"Desirable Program" 1948-52, annually	3,700

The "necessary program" indicates the number of dwelling units which would have to be produced yearly for five years in order to replace completely dwelling facilities destroyed or damaged during the war and to re-establish the prewar level of housing as expressed by the number of dwelling units per 1,000 inhabitants.

Even this program which, as appears from the figures, is ambitious compared with the planned production for 1948, would not allow for any improvement in housing standards. If also, within the same five years, overcrowding were to be relieved and insanitary and unsafe buildings were to be replaced, the yearly volume of production would have to be about 3.7 million dwelling units, or not less than six times the prewar production.

International Co-operation in the Field of Timber

Among the United Nations specialized agencies, questions of production, trade, and consumption of forest products were assigned to FAO in its charter of establishment. A comprehensive study of the world situation in forestry and forest products, prepared by the staff of the Forestry and Forest Products Division of FAO, was laid before the Annual Conference held in Copenhagen in September 1946.

One of the important results of Copenhagen, as far as timber is concerned, was the recommendation to call a conference to discuss problems relating to Europe's timber situation. Accordingly, at the joint invitation of FAO and the Czechoslovak Government,

[2] With the important exception of newsprint, the price of which has risen considerably more than for pulp and other products.

a timber conference was held at Marianske Lazne, Czechoslovakia, in April-May 1947. This conference, which was attended by representatives of 27 nations of Europe and America, defined and analyzed the short-term and long-term European timber problems.[3] Especially, the conference pointed out the importance of raising forest output and achieving economy in the use of timber in all countries.

The conference further called the attention of other international organizations to the urgency of the world timber shortage and recommended that the newly established Economic Commission for Europe, with the technical assistance of FAO, should pay special attention to:

a. increasing available timber supplies and decreasing waste of wood;
b. aiding in reducing economic difficulties which in certain countries stand in the way of increased production, by assisting them in obtaining necessary economic help; and
c. the satisfactory distribution of available timber supplies.

Following upon these recommendations, the Economic Commission for Europe at its second session in July 1947 created a special Committee for Timber, serviced by a secretariat provided by FAO.

Since its establishment, the European Timber Committee has held sessions in October 1947, in January 1948, and a third session in the summer of 1948, which concluded with a meeting in September. The meetings have been attended by representatives from most European countries (with the important exception of the U.S.S.R.), from the United States and Canada, and from the non-European countries adjacent to the Mediterranean which, so far as forest economy is concerned, can be regarded as part of Europe. In the following paragraphs, the activities of the European Timber Committee are described in some detail.

Efforts to Raise Production and Export Availabilities

A basic and continuous task of this committe is to assess the export availabilities and import requirements of softwood lumber. For this purpose, extensive statistical work is carried out by the staff of FAO's European Forestry Working Group.

The balance sheet arrived at, showing export availabilities and requirements, form the main basis for the Committee's discussions on action to be taken in order to meet the deficit.

Table 5 shows the forecast for 1948, the tentative

[3] *Report of the International Timber Conference.* Published by FAO, Washington, 1947.

TABLE 5.—IMPORTS AND EXPORTS OF SAWN SOFTWOOD[1]
(1,000 standards)

Importing European Countries	Actual imports 1937	Actual imports 1947	Import requirements 1948 Essential needs	Import requirements 1948 Effective demand[2]	Import requirements 1949 Essential needs	Import requirements 1949 Effective demand[2]
United Kingdom	2,366	1,419	1,650	1,140	1,700	1,200
Ireland	80	21	57	40	60	50
France	190	154	250	145	275	200
Belgium	190	115	295	210	250	210
Netherlands	374	214	325	260	325	300
Denmark	171	112	350	150	250	200
Switzerland	41	54	66	66	66	66
Hungary	192	58	130	125	150	150
Italy	312	74	355	257	425	145
Greece	70	20	133	110	130	80
Germany	731	—	—	—	—	
Other countries[3]	589	53	642	541	697	586
TOTAL	5,306	2,294	4,253	3,044	4,328	3,187

Exporting Countries	Actual exports 1937	Actual exports 1947	Export prospects[2] 1948 Normal	Export prospects[2] 1948 Maximum	Export prospects[2] 1949 Normal	Export prospects[2] 1949 Maximum
Norway	51	8	36	36	36	36
Sweden	820	409	530	530	375	450
Finland	1,045	474	515	515	350	420
Poland	334	—	48	60	...	...
Czechoslovakia	176	128	65	80	25	...
Austria	317	31	64	68	64	90
Yugoslavia	197	58	65	80	60	160
Rumania	353	—	[6](110)	(110)	(110)	(110)
Germany[4]		616	365	365	255	260
Other sources		44	10	50	10	50
TOTAL for Europe excluding U.S.S.R.	3,293	1,768	1,808	1,894	1,285	1,576
U.S.S.R.	1,362	...	(100)	(150)	(100)	(250)
Canada	508	648	400	450	550	550
U.S.A.	110	225	200	250	250	250
TOTAL[5]	5,273	2,641	2,508	2,744	2,185	2,626

SOURCE: FAO-ECE Timber Committee, Economic Commission for Europe.
... Not available.
[1] Including boxboards and timber equivalent of sawlogs.
[2] As expected by the Timber Committee in June 1948.
[3] Including non-European Mediterranean countries, and smaller amounts of imports to South Africa, Australia and New Zealand from Europe.
[4] Three western zones only.
[5] The difference between total imports and total exports in the years 1937 and 1947 are due to various statistical deficiencies.
[6] Figures in parentheses are estimates.

estimates for 1949 made by the Committee in the summer of 1948, and the actual trade figures for 1937 and 1947. It can be seen that imports in 1947 amounted to less than half the prewar imports. For 1948 no very great increase in timber trade can be foreseen, while for 1949 a distinct decline is anticipated, owing to a reduction in supplies from Germany, reduced Scandinavian exports, and the diverting of European Recovery Program credits from timber to more urgent purchases.

Requirements for 1948 and 1949 are given in two columns, of which the first ("essential needs") shows the quantities which would be purchased if the necessary means of payment were available while the second ("effective demand") shows the quantities which countries anticipate being able to purchase under the circumstances likely to prevail at the time. The effective demand thus defined amounts to 3.0 million standards in 1948 and about 3.2 million standards in 1949, against prewar imports of 5.3 million standards, or, leaving out of account prewar German imports, 4.6 million standards.

The export prospects for 1948 and 1949 are also given in two columns, "normal" and "maximum." The difference between the figures in these two sets of columns is accounted for partly by more optimistic estimates of exports from the U.S.S.R. and the Western Hemisphere, but mainly by increased supplies which could come from some European producing countries, providing they obtained certain equipment and other requirements.

It has already been pointed out that, though the forest resources of Europe (outside the U.S.S.R.) do not by any means make possible a production of lumber sufficient to cover needs, there still are important possibilities for a rapid rise in output in certain countries where lumber production in postwar years has been hampered by special difficulties, such as lack of equipment and fuel.

It has therefore been one of the most important tasks of the European Timber Committee to assess such requirements for equipment and other goods needed to expand domestic timber production, which would make additional quantities available for export or reduce import requirements. At the first meeting of the committee, in October 1947, several countries presented lists of special requirements. A working party screened these lists so that only requirements which were directly connected with an increase in the production of softwood timber in the very near future were considered.

As the result of negotiations among ECE, FAO, the International Bank for Reconstruction and Development, five timber-exporting countries of eastern Europe, and six timber-importing countries of western Europe, agreement in principle has been reached on a plan to grant credit facilities for the purchase of this equipment against additional exports of wood. Details remain to be worked out with individual countries but broadly the Bank would extend credits of $6 to $8 million to timber exporters and simultaneously the importing countries would provide equipment to the value of about $8 million. In return, the Eastern countries would undertake the delivery in two years of timber products valued at nearly $330 million, of which $120 million would be additional exports, over and above the quantities which would otherwise be exported. The Bank's loans would be repayable from the proceeds of these timber deliveries.

As regards Sweden, the main possibility of increasing timber output in the short run lies in increased supplies of mineral fuel, whereby manpower could be diverted from the production of fuelwood to that of timber. Accordingly, the Coal Committee of the ECE, acting upon the recommendation of the Timber Committee, has agreed upon an extra allocation of fuel and Sweden has made considerable extra amounts of sawn softwood and pitprops available for export.

These activities of the European Timber Committee have envisaged an increase in timber availabilities in the very near future. The problems of development of new forest industries so as to alleviate the longer-term timber shortage is being explored by FAO's European Forestry and Forest Products Commission. Any danger of overlapping between the activities of this Commission and the FAO/ECE Timber Committee is prevented by the fact that the two bodies have the same chairman and are being serviced by the same secretariat.

Pitwood

So far the available amount of pitprops during the postwar years has been just sufficient to keep pace with the rise in coal production. Even during 1947 some replenishment of the dangerously small stocks in importing countries could take place.

During the coming years, however, a serious shortage of pitprops may develop. Coal production and, consequently, requirements for pitprops in Europe (outside the U.S.S.R.) are expected to increase by 20 percent from 1948 to 1951. Estimates of pitwood availabilities made by the Coal Division of ECE, of which a summary is given in Table 6, indicate that even if the costly imports of Canadian pitwood to the United Kingdom are assumed to continue, and under the assumption that exports of pitwood from the U.S.S.R. will rise appreciably, total availabilities may fail to rise *pari passu* with increased requirements, unless measures to raise production are taken in good time.

The production of pitprops is hampered, above all, by the strong demand for alternative uses as fuel or pulpwood. Especially in Germany, the acute shortage of house-fuel has limited the production of pitwood, but also in other countries, mainly Sweden and Finland, large quantities of wood have been burned which could have been used as pitprops.

It need not be stressed that the production of pitprops ought to have high priority in programs of timber production and exports. In fact, it is a flagrant example of maladjustment that wood suitable as pitprops should be burned while at the same time coal mines are faced with a shortage of mining timber. It has already been mentioned that action has been taken by the European Timber Committee, in co-operation with the Coal Committee, to direct extra amounts of coke to Sweden against the promise of greater export of pitprops and other timber products.

Currency Problems and Buying Limits

The balance sheet drawn up by the European Timber Committee in July 1948 (see Table 5) shows an effective import demand in 1948 of about 3 million standards compared with prospective export availa-

TABLE 6.—PROSPECTIVE PITWOOD BALANCE FOR EUROPE (EXCLUDING U.S.S.R.)
1948-1951

	1948	1949	1950	1951
	million metric tons	*million metric tons*	*million metric tons*	*million metric tons*
1. Coal production	492	526	564	592
	million m³	*million m³*	*million m³*	*million m³*
2. Pitwood requirements	14.8	15.0	16.0	16.9
PRODUCTION OF PITWOOD				
3. Coal-producing countries	10.3	9.5	10.0	10.4
4. Other European countries[1]	2.4	2.6	2.5	2.5
IMPORTS OF PITWOOD				
5. From U.S.S.R.	0.9	1.3	1.7	1.8
6. From Canada	0.8	0.8	0.8	0.8
7. Total estimated availabilities (3 + 4 + 5 + 6)	14.4	14.2	15.0	15.5
8. Deficit (2 — 7)	0.4	0.8	1.0	1.4

SOURCE: Coal Committee, Economic Commission for Europe.
[1]Including French Zone of Germany.

bilities ranging from 2.5 to 2.7 million standards. The narrowing of the gap between effective demand[4] and available supplies is in some ways an encouraging development. On the other hand, the amount which importing countries declared themselves able to buy was only about half the volume of prewar imports, in spite of drastically increased needs. High prices and currency difficulties have caused this curtailment in effective demand and the European Timber Committee has studied the depressive tendencies with close attention. Ways and means have been discussed of easing the purchasing power difficulties of importing countries, so raising effective demand and contributing to a restoration of more normal conditions in the international timber market.

On the other hand, the committee has had to envisage the danger that a rise in demand during 1948 might lead to competitive bidding-up of timber prices and might prevent some importing countries from getting a fair share of available timber supplies. As a preventive measure against such a development, the importing countries at the committee's meetings in January and June 1948 agreed to regard the announced effective demand as buying limits for each country's timber purchases for delivery during 1948.

[4]Effective demand as exercised by import licensing authorities. It does not, of course, mean that there is not a ready sale for timber on the importing countries' internal markets, though in some countries the internal demand for timber has also of late been limited by reductions of housing programs, etc. Italy provides an example of how a very great reduction of timber consumption can go hand in hand with an even greater reduction of demand. Though timber consumption in 1947 was only about half the prewar figure, the market conditions for timber in the spring of 1948 were described in these terms by an economic periodical: "At present the timber market is characterized by a well-defined excess of supply over demand. There has indeed been a considerable falling off in timber consumption owing to the slowing down of the rate of building reconstruction during the last few months and of the general slowing down of economic activities throughout the country. . . ." (Banco di Roma, *Review of the Economic Condition in Italy*, May 1948, p. 189).

Economies in Timber Production and Consumption

The extreme scarcity of timber has, as is well known, compelled many countries to adopt severe measures in order to achieve economy in its use, mainly through compulsory regulations and standard specification for timber used in construction work. In some countries intensive technical research work in this field has also been carried out.

Considering Europe as a whole, the knowledge and application of technical innovations has spread rather slowly. This is especially true of the building trades, which are carried on by a very great number of independent enterprises and where national traditions play a great role. It would seem, therefore, that here is scope for international co-operation with a view to speeding up the application of modern methods. The same applies to the introduction of new methods in forest work, sawmilling, and—not least—to the derivation of substitute materials from wood waste.

These problems were discussed at the FAO Timber Conference at Marianske Lazne, and the International Forestry Center (C.I.S.), now absorbed by FAO, has made an intensive study of "technical means to reduce Europe's timber deficit." Within the framework of ECE, these problems are being attacked jointly by the Timber Committee and the Subcommittee for Housing. Specialists from various countries in the field of wood technology and house construction have been collecting data about technical measures to achieve economies in timber consumption and production and about practices existing in that respect in various countries. These data should form the basis for recommendations and the offering of assistance to governments by FAO and ECE.

Pulp and Paper

The figures quoted in the text are drawn from official sources and from trade journals. Some are provisional and may not tally with figures shown in the 1948 FAO Yearbook of Forest Products Statistics. *They are useful, however, for disclosing trends. Metric units are used throughout the report, except where otherwise indicated.*

WOOD-pulp production in 1948 is estimated as likely to reach a record figure of 28¼ million metric tons. An even higher total can be expected for 1949, assuming that the upward trend of production in Scandinavia, Central Europe, Latin America, Australia, and Asia continues and that good business conditions prevail in North America.

The outstanding features of the world situation in 1947/48 were, firstly, the continuous production increase in North America where, except for newsprint, a closer balance between supply and demand was established for the first time since before World War II; secondly, the still very low level of production in Europe and Asia, hampered by power, labor, and transportation shortages, with only slight improvements to set against vastly increased needs brought about by progress in sanitation, education, and the drive for higher living standards; thirdly, the planning of new but limited pulp-manufacturing capacity in Latin America, the Pacific area, and certain parts of Asia.

With a leveling off of demand in the U.S.A., production closer to capacity in Scandinavia, industrial recovery in Central Europe and Japan, and a further development of new pulp-producing capacity elsewhere, a considerable improvement in the supply situation within a limited number of years can be foreseen.

The development of new capacity is, of course, closely tied to raw-material supplies, and the need for further developments in improved cooking methods, utilization of waste wood, hardwoods, tropical species and other pulp-making materials, such as esparto and bamboos.

During the war, North America covered the essential wood-pulp requirements of the allied nations, which formerly depended mainly on the northern European countries for their supplies. The end of the war brought a quick resumption of international trade, which is tending to return gradually to its accustomed channels, with the important difference that for the present and coming years Germany, as an important exporter, and Japan, as a large importer, are eliminated.

The main impediment to a more rapid growth of world trade in pulp is the lack of foreign exchange, which vastly restricts the import possibilities of many countries all over the world. Another is inflationary prices, which continued to rise through 1947 and 1948, because of the increased costs of pulpwood, labor, coal, and raw materials. Manufacturers are, however, impressed with the necessity of stabilizing market rates in order to avoid a drop in world consumption. Growing resistance of North-American and Latin-American buyers to Swedish export prices finally caused the cancellation of the Swedish export tax, which produced a price drop in the American market.

World demand for pulp, at reasonable prices, will grow with increased paper consumption by countries becoming industrialized, and with the rapidly growing importance of pulp as a raw material for other industries. World production of various synthetic cellulose fibers can now be placed at close to 2 million tons, 15 to 20 percent of the world's annual fiber supply.

While production of newsprint has increased appreciably in Canada since 1937, it has fallen by almost one-half in the rest of the world. The capacity is there, but it is idle because of lack of raw materials, maintenance, and labor. This is the direct cause of the present acute newsprint shortage, which could be quickly eased by restoration of machine capacity to productivity. High construction costs and the uncertainty of sustained demand seem, in the opinion of the industry, to militate against any extensive additions to existing newsprint mills.

Production

Despite below-normal production in Europe and Asia since the war, world pulp production in 1947 is estimated to have reached the record figure of 26.5 million metric tons against 24.3 million tons in 1946 and 22.1 in 1945. Even greater output is expected for 1948 — the forecast being 28.25 million tons. Probably about 85 percent of world wood-pulp supplies are produced in North America and Scandinavia.

The 1947 production of pulp was about 2 percent greater than that of 1937, which was a record high year. This increase was primarily the result of the establishment of new pulp-making capacity in the South and on the West Coast of the U.S.A. and in western Canada. Mexico, Brazil, and the Argentine have also increased their sources of domestic pulp through newly constructed mills or by expansion of existing capacity. Australia, New Zealand, and India should soon be able to make a greater part of their pulp requirements. Far greater production would be evident but for the loss of capacity of the main prewar pulp-supplying sources.

Pressure on Sweden for pulp supplies when the world was at war and the strain of being compelled to use its forest reserves for fuelwood created repercussions that are now becoming clear. Finland and Norway both, in marked degree, suffered destruction of plant during the war, and Finland lost pulp-manufacturing capacity by treaty.

Besides these two, the greatest losses of pulp-making capacity occurred in Germany and Japan, both of which, apart from physical damage to mills, have lost a considerable part of their prewar production facilities by transfer of territory and of plants as reparations.

The extent of the war damage to the pulpwood resources of European countries has not so far been precisely determined, but is certainly considerable in Austria, Czechoslovakia, Poland, and Rumania, all of which had exportable pulp surpluses before the war.

Regarding market pulp supplies for the paper industry, a marked factor is the ever-growing competition of dissolving pulps. In some countries, a portion of the pulp capacity has been turned over to the making of dissolving pulps. The industries making rayon, staple fibers, plastics, and other new cellulose products have a future of unlimited expansion and growth.

Pulp and Paper Production in North America

The total production of all grades of pulp in 1947 amounted to just over 17.8 million tons compared to 11 million in 1937. This is the largest tonnage on record and was 2 million greater than in 1946. The United States produced 61 percent of the North American total, Canada 37 percent, and Newfoundland 2 percent.

The output of the paper and board industry reached an all-time high of 26 million tons in 1947, production in the United States amounting to 77.5 percent of the total, Canada contributing 21 percent, and Newfoundland nearly 1.5 percent.

United States of America. Pulp production increased by 12 percent from 9,622,000 tons in 1946 to 10,843,000 tons in 1947. Rayon pulp amounted to 371,000 tons or approximately 3 percent of the total output.

Total supply of wood pulp in 1947 was 12,841,000 tons against 11,225,000 a year earlier. This huge gain was almost entirely by integrated mills. Inadequate supplies of purchase pulp at prices that permit competition was a problem for mills lacking pulp-converting facilities.

With a total production of 19,078,000 tons, the U. S. paper industry topped the 1946 production record by 9 percent, a gain of 85 percent over the average output of 1935-39, which was 10,919,000 tons.

In 1947 the volume of business activity ran counter to forecasts of a recession which were prevalent at the beginning of that year. Instead of the predicted decline, practically all industries established new production records.

The trend continues into 1948. The domestic production of wood pulp (5,759,000 tons) during the first six months of 1948 exceeded the same period of 1947 by 6½ percent. Production of all types of paper and board also attained new records for the first half of 1948, amounting to 10,112,000 tons, an increase of 6 percent over the same period of 1947 and 18 percent over 1946.

The uncertainty prevailing early in the year seems to have been dissipated, and most of the industry expects a steady volume of business for the latter part of 1948. There are, however, definite signs that production is catching up with demand, and that a closer balance between supply and demand is being achieved in the industry generally, with the exception of wrapping paper and newsprint.

Comparing physical production of paper-board and pulp with employment of production workers, it is obvious that productivity has increased materially. This is largely the result of advanced pulp- and paper-making machines and equipment, with their faster and more efficient output.

Canada. Production of all grades of pulp amounted to 6,581,000 tons in 1947 as against 6,001,000 tons the year before. Dissolving pulp was 271,000 tons of the total output.

In 1946, production of paper and board was 4,733,000 tons; in 1947 it was close to 5,200,000 tons, an increase of nearly one-half million tons and a new production record.

For the first seven months of 1948, total production of chemical pulp can be estimated at 1,605,000 tons, that is to say, 164,000 tons higher than for the same period of 1947. In view of the favorable working and raw-material situation — a record 1947/48 pulpwood cut may go as high as 25.5 million m^3 (r) — a considerable production increase for 1948 may be expected.

Newfoundland. The two plants producing pulp in Newfoundland cover the needs of the local paper mills, leaving around 10 percent of the output for export. After a drop in production in 1942 and 1943,

World Wood-Pulp Production, 1937–1947

Destination	Total		Mechanical		Sulphite				All Sulphate		All Other	
				Dissolving	All Other							
	1937	1947	1937	1947	1937	1947	1937	1947	1937	1947	1937	1947
	(Thousands of metric tons)											
Total	23,509	24,575										
Europe												
Austria	414	109	110	43	...	...	[3]279	[1]56	25	10	—	—
Belgium	66	43	...	29	...	...	...	[1]14	...	...	—	—
Bulgaria	20	10	3	...	—	—	—	—	...	...	—	...
Czechoslovakia	343	[4]270	73	...	—	...	[3]260	...	10	...	—	—
Denmark	6	1	6	1	—	—	—	—	—	—	—	—
Finland	2,300	1,450	820	495	83	56	959	487	438	412	—	—
France	354	377	250	223	...	...	[3]69	57	35	68	...	—
Germany	2,483	...	1,134	...	...	...	[3]1,284	...	65	—	—	—
Hungary	6	—	6	—	—	—	—	—	—	—	—	—
Italy	186	160	152	95	...	...	...	...	...	65	—	—
Netherlands	121	145	71	46	—	—	[3]50	[2]70	...	...	...	29
Norway	1,095	633	543	307	...	60	[1]479	204	73	62	—	—
Poland	174	...	81	...	—	...	[5]72	...	21	...	—	...
Portugal	10	...	...	...	—	—	—	—	—	—	—	—
Rumania	60	...	13	...	—	...	...	...	...	...	—	—
Spain	10	...	...	...	—	—	—	—	—	—	—	—
Sweden	3,524	2,810	734	625	...	313	[3]1,637	987	1,153	885	—	—
Switzerland	90	[4]110	35	...	—	...	[3]55	[1]57	...	...	—	—
United Kingdom	201	42	183	...	—	—	[3]18	...	...	...	—	...
Yugoslavia	42	...	8	...	—	—	...	...	...	...	—	—
Middle East												
Turkey	7	11	7	5	—	—	—	6	—	—	—	—
North America												
Canada	4,664	6,581	3,071	3,879	...	278	1,246	1,561	284	625	63	237
Newfoundland	321	399	268	309	—	—	53	90	—	—	—	—
United States	5,996	10,843	1,452	1,862	249	371	1,671	2,170	1,941	4,777	683	1,663
Latin America												
Argentina	12	...	...	...	—	—	—	—	—	—	—	—
Brazil	...	[4]80	...	50	—	...	—	...	—	—	—	—
Chile	8	11	8	...	—	—	—	—	—	—	—	...
Mexico	5	[4]51	5	18	—	—	—	4	—	28	—	—
South and East Asia												
China	80	...	...	...	—	—	...	...	...	...	...	...
India	10	...	...	...			...	...		...		...
Japan	901	284	375	167	58	22	404	81	64	12	...	2
Pacific												
Australia	...	136	...	30	—	—	—	—	...	71	—	35
New Zealand	—	19	—	19	—	—	—	—	—	—	—	—

Note: Owing to rounding of figures, there are some discrepancies between the sum of items and totals as shown.
[1]Includes dissolving sulphite.
[2]Includes dissolving sulphite and all sulphate.
[3]Includes dissolving sulphite if any.
[4]Provisional figure.
... Not available.
— None.

Comparative Totals for Countries Listing Both 1937 and 1947 Data

	Production	
	1937	1947
Europe	8,726	6,160
North America	10,981	17,823
Other regions	921	376
Total	20,628	24,359

output of pulp steadily increased to reach an all-time high in 1947 of 399,000 tons,[1] 2 percent of the North American total.

[1]May not include screenings.

Newsprint Production in North America[2]

Taking advantage of unprecedented high demand, North American mills engaged in the manufacture of newsprint paper turned out 5,146,000 tons in 1947. This was an increase of 358,000 tons or 7 percent over the record 1946 production, but was apparently still insufficient to satisfy consumer demand.

Of the regional total, Canadian mills turned out 4,059,000 tons or not quite 79 percent, the U.S.A. produced 749,000 tons or approximately 14.5 percent, while Newfoundland production represented the rest.

For the first seven months of 1948 production again shows an upward trend, totaling 3,026,000

[2]For more detailed information regarding newsprint, attention is drawn to a survey entitled *World Production of Newsprint, 1947* compiled by J. J. Zima, statistician, U. S. Newsprint Service Bureau in co-operation with the Forest Products Branch, Office of International Trade, U. S. Department of Commerce.

tons, making a net regional increase of 61,940 tons or 2.1 percent more than in the similar period of the previous year.

North American Newsprint Production
1939—1946—1947

Country	*1939*	*1946*	*1947*
	(*Thousands of metric tons*)		
Canada	2,603	3,776	4,059
United States	866	701	749
Newfoundland	277	311	338
Total	3,746	4,788	5,146

Pulp and Paper Production in Europe

European pulp production for 1947 can be estimated at 7 million tons compared to 11,494,000 tons in 1937. The general upheaval of industrial and economic activity in Europe has resulted in sharply curtailed production and consumption of pulp and pulp products compared to prewar. Shortage of coal retards larger output in Scandinavia; in other countries most mills find it difficult to procure raw materials (pulpwood, pulp, coal, and chemicals), machinery parts, and equipment. The lack of qualified manpower is another impediment to recovery. Unless special efforts are made, Europe's pulp industry cannot be expected to regain its prewar production levels for several years.

Scandinavia

Sweden, Finland, and Norway, which formerly produced more than half of all European pulp, are still well below their prewar output. The northern forests were overcut during the war and pulpwood output is now being reduced; at the same time the lack of coal has driven these countries to divert roundwood for fuel. Pulpwood output in 1947 was only 21.8 million m^3 (r) compared to 33.9 million in 1937.

Finland. Production of all grades of pulp rose from 1,197,000 tons in 1946 to 1,450,000 tons in 1947, attaining 60 percent of capacity in spite of many difficulties in machinery and equipment, raw materials, and shortage of manpower.

The aggregate output of the paper mills, which in 1946 was 457,000 tons, rose by 14 percent to 518,000 tons in 1947, despite the exceptional drought which led to hydroelectric power shortages.

According to estimates, Finland is expected in 1948 to reach a production of more than 1 million tons of chemical pulp, compared to 955,000 tons in 1947.

Norway. Pulp production of the Norwegian mills showed an increase from 460,000 tons in 1946 to 632,000 tons in 1947, although most mills were only producing at about 48 percent of capacity. During the record year of 1937 Norway produced 1,087,000 tons of pulp.

Shortages of pulpwood, coal, and chemicals have prevented capacity from being used, and the severe drought of 1947 had a very serious effect on the mills, as in the other Scandinavian countries.

With the general improvement of the country's economic situation and barring unforeseen circumstances, 1948 should see another step toward complete recovery; the mills are expected to increase their production to 70 percent of capacity.

Sweden. Total pulp production improved slightly further from 2,680,000 tons in 1946 to 2,810,000 in 1947, reaching 79 percent of capacity; 312,000 tons, more than 10 percent of the 1947 output, were dissolving pulp.

Sweden will probably attain about 85 percent of its prewar pulp output during 1948. In view of the pulpwood situation, no further important increase in production is expected.

The output of paper and paperboard in 1947 exceeded 1,000,000 tons, against the prewar high of 1,063,000 tons of ten years before.

Central Europe

Notwithstanding the enormous difficulties with which most Central European countries are still faced, the output of pulp and paper has been constantly increasing since the end of the war and, with the exception of Germany, may attain prewar levels during 1948/49.

Austria. Total pulp production of all grades recovered from 74,000 tons in 1946 to 109,000 in 1947, approximately 25 percent of the prewar average.

Although the pulp and paper industry escaped with little direct damage from the war, it experienced an almost complete shutdown after hostilities ceased, owing to shortages of coal, pulpwood, and labor.

Before the war Austria produced more pulpwood than it needed for its own industries. Since then the forests have been seriously overcut, and immediately after the war the need for fuel became so great that vast quantities of timber were felled for this purpose. However, the immediate situation is improving and a further increase in pulp output for 1948 can be expected.

Paper and board production amounted to 148,000 tons in 1947, which is approximately half the 1937 output.

Czechoslovakia. In 1947, production of all types of pulp reached more than 70 percent of capacity, with an annual production of approximately 270,000 tons, about 20 to 23 percent below the prewar average output.

Production of the pulp and paper industry during the first four months of 1948, as a percentage of planned production for this period, is reported to be: chemical pulp, 82,987 tons (101 percent); paper, 91,512 (113.4 percent); paperboard, 25,834 (113.8 percent).

The 1947 production of paper and paperboard is reported as about 264,480 tons — approximately 80 percent of capacity and only 10 to 15 percent below the prewar average.

Production of chemical pulp from hardwoods will be undertaken for the first time in Czechoslovakia by a new mill to be established at Vranov in eastern Slovakia. If successful, the additional pulp output will offset the reported severe shortage of pine and spruce supplies.

Germany. With 2,483,000 tons, Germany was, in 1937, the world's fourth largest producer of wood

pulp, and its production of paper and board amounted to 3,568,237 tons for the same year.

Because of the division of Germany into zones, it is very difficult to get an accurate picture of over-all conditions in the pulp and paper industry, but it can be assumed that not even one-third of the prewar tonnage was manufactured in 1947.

The capacity of the German paper industry was subdivided between the zones approximately as follows:

	(*Percent*)
U.S.A. zone	15.5
British zone	23.8
French zone	7.2
Russian zone	53.5

In the Russian zone, where the greater part of the industry is located, the most important factories not destroyed or damaged have been dismantled. It is reported that about 200 plants are operating. They produce about 80,000 tons of paper per year and should reach about 150,000 tons in two years, which suggests that they are all small plants.

In the American zone, approximately 16,000 tons of paper, 2,500 tons of board, and 5,000 tons of cellulose are produced per month. This production could be substantially increased if it were not necessary to allocate a large part of available wood supplies for heating purposes.

In the British zone, the production of paper, board, and pulp is about 15,000 tons per month, compared to 65,000 tons in peacetime. There are no large forest resources in the British zone, and the supply of raw material is made more complicated by the necessity to import from the other zones.

In the French zone the pulp and paper mills, for the most part, are not damaged but the lack of coal, pulpwood, and cellulose makes their economic operation almost impossible.

Hungary. Since Hungary has no timber suitable as raw material for its pulp mills, it must obtain its pulpwood requirements by import.

The productive capacity of the paper mills was 105,300 tons in 1947, compared with 117,300 tons in 1944, 90,000 tons in 1938, and 12,000 tons in 1925. The removal of one paper-making unit as reparations is responsible for the decline in output since 1944.

Poland. The total production of paper in 1948 is likely to exceed 253,000 tons, compared with 205,000 tons in 1947, when prewar production was surpassed.

Raw-material supplies in 1948 are expected to be greater than in the preceding year. Large sums are to be devoted to repair of rundown machinery and to maintaining regular supplies of power. Rehabilitation of war-damaged factories is reported to continue on a big scale.

Switzerland lacks sufficient resources to cover the entire needs of its paper-making industry. From 1930 on, however, the industry turned to an increasing use of domestic pulpwood and the war forced the industry to use domestic raw materials exclusively.

Wood-pulp production in 1946 totaled 108,000 tons as compared to 90,000 tons in 1937, almost meeting the 1946 requirements, reported as 128,000 tons.

Paper and board production for 1947 amounted to almost 200,000 tons, compared to approximately 150,000 tons in 1937. Domestic production now supplies more than 90 percent of requirements.

Western Europe

The pulp and paper output of several West-European countries could be increased if machinery and the necessary materials were procurable. Most paper mills, however, such as those in Denmark, the Netherlands, Belgium, France, and the United Kingdom, depend on imported pulp, which continues in short supply on domestic markets.

Notwithstanding these difficulties, certain western European countries have stepped up production considerably since the end of the war.

Belgium. Pulp production dropped from 66,000 tons in 1937 to as low as 4,000 tons in 1945. However, in 1946 it increased to 15,000 tons and attained 43,000 tons in 1947. Paper and board production increased from a total output of 196,000 tons in 1946 to 237,000 tons in 1947, surpassing the 1936 level.

France's pulp production — 354,000 tons in 1937 — was down to 82,000 in 1944. In 1946 it rose again to 262,000 tons and in 1947 it exceeded the prewar level by approximately 23,000 tons.

Paper and board production for 1947 reached 900,000 tons, exceeding 1946 results by 30 percent, and attained approximately 70 percent of the 1936-39 average annual output.

Monthly pulp production continued to rise through 1948, and a considerable increase in total output for the year is expected, reaching about 480,000 tons.

United Kingdom. Normally the pulp and paper industry in the U.K. is based on large imports of chemical and mechanical wood pulp, aggregating about 1,600,000 tons annually in prewar years. Shortage of wood pulp now prevents production from rising to higher levels.

A few pulp and paper plants suffered from direct war damage, but this was not so extensive as to impair seriously the production capacity of the industry, which has not altered materially from that of the basic prewar year. Mills are well equipped with special machinery to manufacture all grades of paper. No increase in capacity is likely in 1948.

The total production of paper increased by 43 percent in 1946 over 1945 and amounted to 1,736,000 tons. In 1947 the output remained practically the same as for 1946.

The estimate of production for 1948 has been set at roughly 10 percent above 1946 levels. The increase for newsprint has been put at 20 percent.

Netherlands. Total wood-pulp production in 1947 amounted to 145,000 tons, reaching approximately the prewar level.

Depending entirely on imported pulpwood, domestic production had been practically at a standstill for several years. Imports from the U.S.S.R. are being sought.

Total production of paper and board in 1947 amounted to 197,000 tons.

Mediterranean

Greece. Production of paper and board dropped from a level of 22,680 tons in 1937 to 9,304 tons in 1946. The total output of the industry in 1947 was expected to be about 80 percent of 1937, and estimates for 1948 indicate a rise of from 100 to 120 percent over the 1937 figure.

Italy. Total pulp production increased from 106,000 tons in 1946 to 161,000 tons in 1947. However, only 65,000 tons of this figure were chemical pulp, compared to the peak of 90,000 tons in 1941.

The 1946 paper and board production represented 36 percent of prewar figures. In 1947, 375,000 tons was reached or 70 percent of prewar output.

Turkey. Production of wood pulp was 6,000 metric tons in 1946, output being hampered by the shortage of domestic raw materials. It rose, however, to 11,000 tons in 1947.

Paper and board production was 17,000 tons in 1946 and 20,000 tons in 1947. Annual plant capacity is estimated at 23,000 tons and total requirements at 52,000 tons.

Soviet Russia. Paper production amounted to 812,000 tons in 1940, board to 127,000 tons. In 1947, production reached prewar levels again.

According to the new five-year plan, in 1950 production will reach 1,340,000 tons of paper, 65 percent more than in 1940. Special increase is foreseen in paper board and packaging papers.

Newsprint Production in Europe

Output of newsprint in Europe rose from approximately 1,358,000 tons in 1946 to 1,452,000 tons in 1947. All producing countries, with the exception of the U.K. and Germany, increased or equaled their output, compared to 1946. The largest increase—55,000 tons—was recorded by France, followed by Finland with an increase of 30,000 tons, Belgium 13,000 tons, Austria 8,000 tons, and Sweden 4,000 tons. Nevertheless, nearly all European countries are short of newsprint supplies and over-all output is still well below prewar levels.

Nowhere is the situation so dark as in the United Kingdom, where more than half a million tons per annum of newsprint capacity are currently lying idle. The U.K., which in 1946 was the world's fourth largest producer of newsprint, last year dropped to sixth place, behind Sweden and Finland, turning out 42,000 metric tons less than in 1946, which is equivalent to only one-third of the tonnage made in 1939. Compared with 1937, domestic production has fallen from 813,000 metric tons to 256,000 tons in 1947.

Among the Scandinavian producers, Finland had 220,000 metric tons of idle capacity in 1947 and in 1946 Norway had 80,000 tons. In the Netherlands, output in 1947 was some 60,000 tons under the 1937 level.

The main reasons for the idle capacity in Europe, which can be estimated at close to 900,000 tons, can be attributed to wartime destruction, overcutting of timber, shortages of raw material, transport, labor, qualified technicians, want of foreign exchange necessary for renewal of machines and equipment, diversion of newsprint machinery to production of more profitable papers, and diversion of pulpwood for fuel or to the more profitable cellulose products.

European Newsprint Production
1937—1946—1947

(*Thousand metric tons*)

Country	1937	1946	1947
Sweden	283	270	274
Finland	421	240	270
United Kingdom	813	299	256
France	*250	121	176
Norway	190	111	115
Germany	385	*73	*65
Belgium	54	32	45
Austria	83	30	38
Switzerland	40	40	40
Netherlands	96	31	40
Czechoslovakia	45	36	39
Italy	*60	29	34
Poland	37	28	35
Spain	19	13	14
Hungary	5	3	9
Portugal	----	2	2
	2,778	1,358	1,452

*Exclusive of the Soviet Union.

Pulp and Paper Production in Latin America

The growth of the paper and paperboard industry during the past ten years is illustrated by the fact that the annual average production for 1945-46 was almost double that of the period 1935-37. It is now estimated to rate at 56 percent of total consumption, as contrasted to 38 percent ten years ago.

This upward trend has been slowed down by postwar conditions, and the industry is still in the initial period of growth. Many plans have yet to be put into effect. Large shipments of pulp- and paper-making machinery went in 1946 and 1947 to Argentina, Brazil, Chile, Cuba, Mexico, and Venezuela, which may be an indication of greater output to come. There is, however, a limit to the expansion possible because of scarce pulp supplies. Although pulp production has greatly increased in certain Latin-American countries, further developments will largely depend on the determination of the pulping properties of indigenous species. Some progress has been made in the use of other domestic pulping materials, such as bagasse, straw, etc.

Argentina. In Argentina, the current five-year plan calls for the building of two big cellulose factories. One, with a yearly capacity of 20,000 tons, will be built in the territory of Missiones; the other, with a capacity of 15,000 tons, will be built in the province of Buenos Aires. The aim is to make the country independent of pulp and paper imports by 1951. A special commission appointed by the government will make a survey of the forest species suitable for the manufacture of pulp products and investigate the costs of labor, transport, wood, and the best locations for establishing further plants.

Average annual production of paper and paperboard rose from 83,000 tons for 1935-37 to 132,000 tons for 1939-41, and to 150,000 tons for 1945-46.

Brazil. In Brazil, apart from approximately 3,000 tons of dissolving sulphite produced from cotton linters and waste, and about 3,000 tons of low-quality sulphite, no chemical pulp was produced until a short time ago.

Faced with a reduced supply of imported chemical pulp and in view of the growing demand for paper at very remunerative prices, modern, fair-sized mills are now being constructed, but the lack of equipment and pulp still impedes a rapid growth of the industry. In 1947 the domestic industry supplied at least 20,000 tons of the 100,000 tons of chemical pulp required by Brazilian industries. Production of mechanical pulp, in which the country is now self-sufficient, increased from 46,000 metric tons in 1942 to 60,000 in 1947.

This increased output is mainly due to Brazil's new paper mill, Industrias Klabin do Parana, at Monte Alegre, State of Parana, which in December 1947 was producing newsprint at the rate of about 60 tons daily, representing one-third of the country's newsprint consumption, and sulphite pulp at the daily rate of about 40 tons. For 1948 an annual output of 30,000 metric tons of newsprint is expected, which will eventually be raised to 40,000 tons.

Chile. Production of paper and board has almost doubled since 1937. Average annual production rose from 20,000 tons for 1935-37 to 34,000 tons for 1939-41, and to 37,000 tons for 1946-47.

Small local pulp-production is restricted to straw and mechanical pulp. However, investigations are being made into the possibilities of producing chemical pulp, for which the country possesses adequate forest resources and other raw materials.

Mexico produced 27,010 tons of pulp in 1946. Of this total, 15,189 tons were groundwood and 11,821 tons chemical pulp. Pulp production in 1947 was approximately 51,108 tons — 18,137 tons groundwood and 32,971 tons chemical pulp. This marks a substantial increase over the output in 1937, when the total was 18,636 tons — 14,118 tons groundwood and 4,518 tons chemical pulp.

Contributing largely to output in 1947 is the unbleached sulphate pulp of the new kraft paper mill at Atenquique, Jalisco. Its annual production capacity is estimated at 26,400 tons.

The paper and board industry estimates its production for 1947 at 138,768 tons which means that output has doubled within the past 5 years.

Two new mills are now in process of construction, one for the manufacture of high-grade cigarette paper, with a capacity sufficient for domestic requirements, and the other for the manufacture of tissue paper.

Peru. Although wood pulp is not manufactured in Peru, bagasse pulp is combined with imported wood pulp in equal proportions for use by the paper industry, chiefly in the production of paper board.

The production of bagasse, which amounts to more than 5,000 tons annually, is almost five times as large as in 1940. The output is, however, limited by the high transportation costs of sugar cane.

The paper industry now operates at about 67 percent of capacity because of shortages of raw materials. Notwithstanding, the industry increased its output from 1,740 metric tons in 1937 to almost 18,000 tons in 1947. The effective capacity of Peruvian mills amounts to 25,200 tons (13,700 paper and 11,500 paperboard). Newsprint, better-quality papers, and most manufactures must be imported.

Pulp and Paper Production in Oceania

Australia. The total production of pulp increased from about 600 tons in 1938/39 to nearly 94,000 tons in 1946 and 136,000 tons in 1947. Additional extension of total capacity to 160,000 tons is under consideration.

Paper manufacturing has been established in Australia for many years, but there was no marked development in the industry until about 1938/39, when plants for the production of pulp from native timber went into operation. The industry is chiefly centered in the states of New South Wales, Victoria, and Tasmania. Pulping plants, producing pulp from eucalypt timber, are operating in Victoria and Tasmania, while in South Australia pulp is being produced from locally grown softwoods.

The total paper and board production for 1947 was 182,000 tons.

In Tasmania, smallest state in the Commonwealth, are all the principal essentials of the newsprint industry. There is a combination of magnificent forests and unlimited water supply, which provide the raw material, water for treatment, and cheap electricity. From one machine now operating some 30,000 tons of newsprint are produced, but plans are already well advanced to raise the production above 70,000 tons.

New Zealand. The New Zealand government is planning the establishment of extensive state paper and pulp manufacturing works in the exotic forest reserves between Murupara and Kaingaroa. The announcement of the government's plan followed successful tests carried out recently in Tasmania, when New Zealand pulp was converted into newsprint.

New Zealand's west coast provides all the necessary natural factors for paper-making—abundant supplies of coal, water, and timber, and the introduced *Pinus radiata* reaches maturity there in about half the time that it takes in Canada. Actually the country lacks manpower and machinery, but paper-making could be a great industry for new immigrants, not only in the production of newsprint but also of papers required for butter wrapping, packing cartons for butter, honey, and many other products.

Pulp and Paper Production in South and East Asia

India. The development of bamboo as an excellent paper-making raw material and the grant of protection in 1925 helped the progress of the home industry. In 20 years, the output of the industry increased from 37,000 tons to more than 122,000 tons.

Plans have been made to establish a plant for the manufacture of newsprint, using indigenous hardwoods as raw material, and production is expected to be at a rate of 100 tons daily within two years. The Industrial Panel on paper and board industries in India has recommended production targets for various kinds of papers of 268,000 tons in 1951/52 and 478,000 tons in 1956/57.

Japan. The impact of shortages during World War I resulted in the development of a domestic pulp and paper industry, which in 1940 was the largest in the East, and placed Japan among the leading pulp- and paper-producing countries of the world.

Japan attained virtual self-sufficiency in paper pulp by 1938. The loss of the southern part of Sakhalin, of overseas imports, and the shortage of pulpwood, coal, and chemicals reduced domestic pulp production from its peak of 1,277,000 tons in 1941 to 232,000 tons in 1945 (18 percent of 1941), about 25 percent of the rated production capacity of the remaining mills. After a temporary decline in 1946, production rose to 284,000 tons or 32 percent of capacity in 1947; 167,000 tons of the total output were mechanical pulp.

Rayon pulp output expanded rapidly from 4,000 tons in 1932 to 295,000 tons in 1941, but in 1945 it was only 10,000 tons, about 5 percent of rated production capacity.

Pulp production increased to 109,000 tons in the first four months of 1948, compared with 74,000 tons in the corresponding period of 1947.

The total paper and board output was 210,000 tons in 1946 and 287,000 tons in 1947, as against 787,000 tons in 1935 (last prewar data available).

Gains also were noted in paper production in the first four months of 1948, over the corresponding period of 1947. The index of the paper output was 55.6 in April (1930-34 = 100) as compared with 38.6 in 1947, 28.4 in 1946, and a high of 174.7 in 1940.

China. In China, wood pulp provides approximately 10 percent of the raw materials reported to be used in papermaking. Nine thousand tons of wood pulp were consumed in 1946, compared with 91,000 tons of other vegetable fiber pulps.

Trade

International pulp trade is tending to return to prewar patterns. However, the relative scarcity of pulp supplies from the major European producing countries plus dollar shortages are the main impediments to any further recovery in the volume of world trade.

Canada, having doubled its exports since 1937, supplies mainly the U.S.A., some of its old customers in Latin America, and the British Commonwealth.

The U.S.A. has dropped out of international trade as an important exporter of wood pulp. Sweden partly fills the gap, but Finland also has made successful efforts to re-establish its export trade.

With the progressive rehabilitation of the Central European economy, Austria may soon resume its former importance on the supply market, although Germany is likely to be eliminated for several years to come.

Pulp and Paper Trade in North America

United States. Pulp imports in 1947 of more than 2.1 million tons, nearly half of all world imports, represented a gain of around 270,000 tons over 1946, when 1.6 million tons were imported. The record figure still stands at 2.2 million tons, imported in 1937.

Canada supplied 65 percent of total U.S. imports in 1947, Sweden 25 percent, and Finland about 10 percent.

In the first six months of 1948, pulp imports approximated 1,090,000 tons, a striking increase (15 percent) compared to the same period of the previous year. Canada is again the largest supplier, with slight gains in deliveries from Sweden and Finland. However, there is some curtailment of demand for market pulp because of increasing resistance against prices of overseas pulp.

In 1947 the paper and pulp market created dollar exchange at the rate of over $50 million a month or $600 million a year. In 1946 the figure was $419 million. These dollars are available to the countries that supply the U.S. market with newsprint, pulp, and pulpwood.

Canada's economy stands to gain most from exports. In 1946 its total exports of paper, pulp, and pulpwood were valued at more than $425 million. Eighty-eight percent of its pulp exports, practically all of its pulpwood, 84 percent of its newsprint, and 23 percent of other paper manufactures went to the U.S.A. In 1947, the percentages for pulp and newsprint were 88 and 87 respectively. The value of Canada's total exports of pulp and paper in 1947 is put at $530 million, or 20 percent of the value of all foreign trade ($2,673 million).

Pulp and Paper Trade in Europe

Exporting Countries

Finland. Finnish exports of wood pulp increased by 30 percent from 555,000 tons in 1946 to 734,000 tons in 1947, but were still only half of the 1937 all-time high of 1,470,000 tons. Nearly 454,000 tons went to the United Kingdom and the U.S.A., 118,000 tons to Soviet Russia, about 136,000 tons to Europe, and the balance mainly to Latin America.

Pulp exports, which make up about one-quarter of the entire exports of the country, are likely to show about a 10 percent increase in 1948 over 1947, provided labor peace is maintained in the industry and costs are kept under control. For the first four months of 1948, shipments of chemical pulp were nearly three times greater than during the same period of 1947, rising from 96,970 to 232,652 metric tons, but this is mainly because shipping conditions in the winter and early spring of 1947 were very unfavorable.

During 1948 the U.S.S.R. absolved Finland of further obligation to deliver pulp and paper for reparations until the end of 1952. This action will, without any doubt, increase the availability of Finnish pulp, when it is considered that Russia received during 1947 nearly 97,000 tons of reparations pulp from Finland.

Norway. Total exports of all pulp grades amounted to 179,000 tons in 1946 and 241,000 tons in 1947, not quite a third of the 1937 level, which, however, marked an all-time high.

As the paper and board mills are operating close to capacity, any increase in pulpwood supplies should in-

International Trade in Wood Pulp
(*Thousand metric tons*)

Exports

Country	1937	1947
Europe		
Austria	186	9
Belgium	23	*
Czechoslovakia	138	44
Finland	1,470	734
France	40	2
Germany	166	...
Norway	655	241
Poland	3	.
Sweden	2,577	1,797
Switzerland	7	...
United Kingdom	—	1
North America		
Canada	790	1,541
Newfoundland	3	40
United States	290	118

Imports

Country	1937	1947
Europe		
Austria	4	1
Belgium	146	207
Czechoslovakia	9	...
Denmark	82	72
France	665	295
Germany	182	...
Greece	24	7
Hungary	41	...
Ireland	6	19
Italy	250	182
Netherlands	112	135
Norway	19	35
Poland	23	15
Portugal	...	13
Spain	125	26
Sweden	—	4
Switzerland	21	61
United Kingdom	1,796	876
Yugoslavia	22	...
U.S.S.R.	70	121
Near East		
Turkey	...	5
North America		
Canada	19	26
Newfoundland	—	—
United States	2,155	2,115
Latin America		
Argentina	42	47
Brazil	100	104
Chile	15	19
Cuba	10	27
Ecuador	3	—
Mexico	36	44
Peru	1	7
Uruguay	4	6
Venezuela	3	6
South and East Asia		
China	15	8
India	10	5
Japan	470	6
Pacific		
Australia	43	34
New Zealand	5	10

*Less than 500 m.t.
... Not available.
— None.

crease the availabilities of mechanical and chemical pulp for export. It is not anticipated, however, that there will be any important increase this year.

Sweden's total export of pulp dropped slightly from 1,805,000 tons in 1946 to 1,797,000 tons in 1947, approximately 70 percent of the 1937 figure. This decrease is due to a decline in mechanical pulp exports of around 40,000 tons. The shift in exports towards bleached grades has been accentuated since the end of the war.

The largest single buyer in the Swedish market in 1947 was the U.S.A., which took 30 percent of all exports. Twenty-one percent went to the United Kingdom, 36 percent to the rest of Europe, 11 percent to Latin America, and 2 percent to countries of Asia.

Pulp exports during the first six months of this year, amounting to around 800,000 tons, represented a gain over the 715,815 tons exported in the corresponding months of 1947, while paper exports for the same periods were 237,675 tons and 201,832 tons.

It is anticipated that returns for the later part of the year will show some shift of markets, because of cancellations of U.S.A. purchases and a notification by Argentina and Brazil that these countries would no longer be able to pay for pulp purchases in dollars.

According to Swedish officials, the timber situation will not permit any appreciable increase of exports during the next ten to twenty years.

Exports in 1947 of paper and board, excluding newsprint, amounted to 285,691 tons. Nearly 150,000 tons of newsprint were exported, compared with 120,000 tons in 1946 and 200,000 in 1937, which was the Swedish industry's best year.

The former pulp-exporting countries of *Central Europe* now contribute practically negligible amounts to the European market.

Austria. Although Austria's pulp exports increased slightly between 1946 and 1947, they are still very far below the record figure of 186,000 tons in 1937. Total exports of pulp and pulp products for 1937, 1946, and 1947 amounted to 335,900, 17,400, and 42,960 tons respectively.

Czechoslovakia increased its pulp exports from 28,000 tons in 1946 to 44,000 tons in 1947, but this figure barely constitutes 30 percent of the prewar rate. Paper exports, which nearly tripled from 10,000 tons in 1946 to 28,000 tons in 1947, are just 10 percent of the record year of 1937.

Germany. Until 1936, Germany was, after the Scandinavian countries, the most important pulp exporter in Europe, attaining a record figure of 308,000 tons in 1934. In 1937 paper exports reached an all-time high of 430,000 tons. Presumably, many years will pass before Germany again becomes an important factor in the European pulp and paper market.

Importing Countries

With the cessation of central European pulp exports, the various European importing countries are limited in their sources of supply to the Scandinavian countries, an exception being approximately 127,000 tons of pulp shipped from Canada to the United Kingdom. Trade is governed in many instances by bilateral agreements, designed to permit or restrict the shipment of goods according to the currency situation.

Most countries need, of course, considerably more pulp than they get or can afford to buy. It is, how-

ever, expected that import prospects for 1948 will prove to be more favorable than in 1947.

France. Before the war France imported, mainly from Scandinavia, 665,000 tons of pulp. After falling away practically to nothing, receipts rose to about 200,000 tons in 1946 and 295,000 in 1947. Imports from Finland amounted to only about a fifth of its prewar share and from Norway to about a third.

United Kingdom. In prewar years, imports of chemical and mechanical wood pulp aggregated about 1,796,000 tons annually. In 1947, imports totaled 876,000 tons, not quite 50 percent of prewar.

It is estimated that requirements for 1948 will be 80,000 to 100,000 tons above 1947. Because of the favorable British trade balance with Sweden, it is anticipated that a substantial part of the additional requirements will be purchased from Sweden. Total requirements include 254,000 tons of paper-grade chemical pulp and 68,000 tons of dissolving sulphite pulp.

Sweden's exports of all grades of pulp to the United Kingdom for 1946, 1947, and the first six months of 1948 were 532,169, 429,026, and 209,648 tons respectively.

Total imports of paper and boards in 1947 were 470,000 tons, which compares with 294,000 tons in 1946 and 379,000 tons in 1937. The 1947 figure represents not quite 40 percent of the prewar total.

Exports of paper and boards reached a total of 113,000 tons in 1947, slightly less than in 1946 (115,000 tons) and just over half of prewar levels (391,000 tons).

Italy. After two years of virtually no supplies, pulp imports increased from 119,000 tons in 1946 to 182,000 tons in 1947, which is about half of the record year of 1935. Imports of paper and board were 15,000 tons in 1946 and 19,000 tons in 1947.

In *Belgium* and the *Netherlands*, imports of pulp, although below requirements, have exceeded the prewar level.

Pulp and Paper Trade in Latin America

Lack of dollars is the most serious obstacle in the South American pulp and paper market. The problem is particularly acute in Argentina, where there exists a big demand for imported papers, but the government grants virtually no import licenses.

However, the long-term outlook for pulp and paper exports to South America is favorable. Potentially, Latin America is a huge market, mainly for manufactured products, and local production will take many years to catch up with demand.

During the war the U.S.A. was the main source of supply for pulp. In 1945, Sweden resumed its prewar leading position in pulp imports and in 1947 provided 193,000 tons out of the total recorded imports of 258,000 tons, the balance coming from the U.S.A. (26,900 tons), Finland (18,000 tons), Canada (12,400 tons), and Norway (6,900 tons).

World Trade in Newsprint

Only five countries—Canada, Newfoundland, Finland, Sweden, and Norway—are important exporters of newsprint.

The most important, Canada, exported 95 percent of its 1947 production (3,829,000 metric tons) to all parts of the world. The largest market was the U.S.A., absorbing 87 percent of Canada's exports; 152,000 tons went to Latin America; 147,000 tons to Australia; about 66,000 tons to Europe, where the United Kingdom is the largest customer, taking 58,000 tons; 36,000 tons went to Africa; and nearly 54,000 tons to Asia.

Ninety-eight percent of Newfoundland's production is for export, since local consumption is insignificant. In 1947 exports amounted to 331,000 tons; 56 percent went to the U.S.A., the rest to the United Kingdom, Australia, and Latin America.

Finland exported 247,000 tons in 1947, home consumption being limited by law to 9 percent of production; 71,000 tons went to the U.S.A., 105,000 to Europe, 54,000 to Latin America, and 12,000 to Asia.

Sweden's exports, amounting to 150,000 tons, slightly more than 50 percent of production, went to more than 50 different countries. The most important customers were Argentina (35,000), the U.S.A., (28,000), and France (10,000).

Norway's exports amounted to 96,000 tons and were about five times the apparent domestic consumption. The most important markets were Argentina (27,000), Denmark (14,000), and India (12,000).

Of all other European countries only Austria and France exported more than 10,000 tons each.

The U.S.A. imported about 3,600,000 tons in 1947, 97 percent originating in Canada and Newfoundland, the balance coming from seven European countries.

Latin America received 375,000 tons of newsprint in 1947, 215,000 of which was shipped from North America and 160,000 from Europe. Argentina was by far the largest importer, with 147,000 tons, followed by Mexico with 59,000 tons, Brazil with 58,000 tons, and Cuba with 23,000 tons.

A total of 120,000 tons was shipped from North America to Europe. The larger part of these shipments, 110,000 tons, went to the United Kingdom. Of the newsprint produced in Europe, 44,000 tons went to Denmark, 34,000 to Soviet Russia, 27,000 to the United Kingdom, 24,000 to France, 19,000 to Belgium, 10,000 each to the Netherlands and Portugal, and 9,000 tons to Greece.

In Africa, the largest importer was the Union of South Africa, which took 53,000 tons. Egypt received 8,000 tons.

A total of 122,000 tons, 27,000 more than in the previous year, were imported into Asia. Total imports of Australia and New Zealand were recorded as 199,000 tons, 21,000 more than in 1946.

Prices

The scarcity of wood pulp in relation to requirements, increased costs, rising wages, and the international character of the market for wood pulp have caused a continuous increase in market prices. However, dollar shortages and the resistance of American buyers may now have a stabilizing effect.

The U.S.A. position may be cited as an example. In 1926 bleached sulphite sold in the U.S. market at $83.88 per ton; in 1939 at about $55 per ton. In July 1948, North American contract prices for bleached pulp had advanced to $139-$149. The advance over 1939 approximates the average increase in agricultural and manufactured products.

Imports of wood pulp from Europe were resumed in July 1945. However, from that time to November 1946, prices for these imports were identical with OPA maximum prices for domestic pulp. Basic transportation allowances were granted.

In December 1946 the Swedish prices (ex-dock New York) were raised for the first time and in the second quarter of 1948, prices for bleached sulphite ranged from $204 to over $220 per ton. Although American buyers grew more and more reluctant, and cancellations were made, Swedish manufacturers reaffirmed their third-quarter quotations.

With the lifting of the Swedish export tax in the beginning of September—it amounted to around $13 a ton—the prices of Swedish pulp have now been reduced by $11 to $22 per ton, with bleached sulphite running from $182 to $187. Bleached sulphate running now from $176 to $193 used to sell for $204 to $209. Unbleached sulphite is $11 to $19 per ton lower than previously quoted.

Finnish pulp producers have reduced their fourth-quarter export prices to a level approximately that of the new Swedish quotations.

For the third quarter of 1946, Swedish pulp to the United Kingdom sold at the following prices per ton:

£14.17.6 for bleached sulphite—f.o.b. Swedish ports
£34. 0.0 for strong sulphite—f.o.b. Swedish ports
£32.12.6 for Kraft—f.o.b. Swedish ports
£17.17.0 for mechanical pulp—f.o.b. East Coast port

Average Prices of Domestic and Foreign Sulphite in the U.S.A.

(*Dollars per metric ton*)

	Average controlled O.P.A. maximum prices for Domestic and Canadian Sulphite (delivered[1])	
	Bleached	Unbleached
1942	$ 82.43	$71.85
1943	83.75	72.73
1944	93.01	80.01
1945	94.77	81.55
1946	105.13	90.80

	Domestic and Canadian Sulphite (Delivered[1])		European Sulphite (ex-dock New York)	
	Bleached	Unbleached	Bleached	Unbleached
1947	130.92–137.53	123.86	136.98–188	132.68–158.69
1948	138.85–148.77	137.75–143.26	199.02–209.82	166.18–178.08

[1]Delivered, with maximum freight allowances.

In December 1947 an agreement was reached with the British Paper Control on the prices for the first half of 1948, implying an increase of £4.10 per ton for chemical pulp and of £5 for mechanical pulp, as compared with the prices at the end of 1947.

In June, the average price for bleached chemical pulp amounted to £49.3.11, which compares with a price of £15.17.3 in 1938.

The price reduction on the American market as the result of the abolishment of the Swedish export tax may result in continued American purchases on or about former levels. In that case, no drop in prices on other markets is likely.

An increase in the price of newsprint, bringing it to $106 per metric ton plux tax in Canada, has recently been announced. The new price is double that prevailing in 1941. The cost to the consumer in Canada is now $114.26, with the addition of the sales tax. The all-time high in New York was $124.09 in 1920.

Newsprint producers stated that their costs, especially in logging and labor, have increased so fast that the last $6 jump which went into effect in January 1948 did not cover them and that newsprint is selling below the level of other commodities.

Consumption

There has been a steady increase in consumption of wood pulp in the United States since the end of the war by the paper and board industries and by the chemical industry. In 1947 the paper and board industries consumed close to 12 million tons of wood pulp, 10 percent more than in 1946 and 54 percent more than in 1939. For the first five months of 1948, pulp consumption was 8 percent greater than for the corresponding period of last year.

The pulp consumption of the rayon industry increased from 293,000 tons in 1946 to 364,000 tons in 1947. No data are available for the consumption of dissolving pulps for the production of other chemical products, but such consumption is undoubtedly also on the increase.

Although the requirements in most European countries for pulp and pulp products have grown considerably since the war, consumption is at a very low level—approximately 40 percent of what it was in the prewar period—for reasons which have already been given. Although Germany will not be important as a major consumer of pulp and pulp products for the next few years, most European countries hope to increase their standard of living, which should raise consumption above the prewar level, once supplies are available.

World Wood Pulp Supplies Available for Consumption
(*Thousand metric tons*)

	1937	1946	1947	Percentage Change 1947 versus 1937	1946
Canada	3,892	4,727	5,008	+29	+ 6
Newfoundland	317	351	355	+12	+ 1
United States	7,842	11,225	12,841	+64	+14
North America	12,051	16,303	18,204	+51	+12
Finland	831	648	722	—13	+11
Norway	459	325	471	+ 3	+45
Sweden	981	878	1,023	+ 4	+17
Northern Europe	2,271	1,851	2,216	— 2	+20
Other countries	9,952	*5,463	*6,100	—39	+12
World	24,274	*23,617	*26,520	+ 9	+12

World Newsprint Consumption
1939—1946—1947
(*Thousand metric tons*)

	1939	%	1946	%	1947	%	% Change 1947 vs 1939	1946
United States	3,217	47	3,897	61	4,312	62	+34	+11
Rest of World	3,680	53	2,529	39	2,631	38	—29	+ 4
World Total	6,897	100	6,426	100	6,943	100	+ 1	+ 8

Newsprint Consumption in U.S.

Year	Population	Thousand Metric Tons	Kg Per Caput
1929	121,526,000	3,429	28.2
1933	125,770,000	2,440	19.4
1937	129,257,000	3,475	26.9
1946	141,229,000	3,897	27.6
1947	143,382,000	4,312	30.1

The greatest drop in consumption appears to have occurred in Asia, where consumption seems hardly to reach 25 percent of prewar.

On the other hand, in certain Asiatic countries, for instance India and China, large social and industrial development programs should mean an increasing pulp and paper consumption.

Even a small increase in the per caput consumption of pulp products of only 2.3 kilograms (5 pounds) a year in China and India would mean an additional consumption of 2¼ million tons for these two countries, which have about 40 percent of the world population within their borders. This would require a tremendous increase in domestic manufacturing capacity, since supplies from other continents are not likely to be available in quantity.

If the demand for pulp and paper increases steadily throughout the world, which is probable in view of the rapidly growing importance of pulp as an industrial raw material (the urgent need for textiles and clothing in Europe and other parts of the world and the growing extension of the plastics industries absorb ever-growing quantities of dissolving pulps), it seems likely that it would be possible to create sufficient manufacturing capacity to keep pace with demand.

Long-term plans for increased and new capacity have already been made public for Latin America, China, India, Australia, New Zealand, and Alaska. However, due consideration will have to be given to sustained raw-material supplies. In this connection, improved pulping methods, utilization of waste, and tropical hardwoods will play an important role in the future.

Newsprint

In 1939 total world consumption of newsprint paper amounted to 6,897,000 tons, 47 percent of which was consumed by the U.S. and 53 percent by the rest of the world. Since 1939 U.S. consumption has increased by 34 percent. Europe's consumption, on the other hand, has dropped by 29 percent. Total world consumption for 1947 was about 1 percent over 1937.

In 1947 newsprint consumption in the U.S. reached a new record-breaking peak of 4,312,000 tons. This was an increase of 415,000 tons, or about 10½ percent, over 1946, the previous record year.

For the first time since 1929, consumption has exceeded the growth in population in the U.S. The 1947 per caput figure was 1.9 kg greater than the previous all-time high of 28.2 kg in 1929.

The Work of FAO

Black Italian poplar, Populus carolinensis, *measuring 4.42 meters in circumference, 1.50 m. from the ground. This tree is in the grounds of a private villa near Torviscosa, Venetia.*

Research Tour of the International Poplar Commission, April 1948

The second annual meeting of the International Poplar Commission was held in Italy with sessions in Milan, Venice, and Casale Monferrato. In the course of these meetings, questions on the agenda were discussed and plans were adopted for the establishment of a draft nomenclature of European poplars and for the preparation of card indexes for identifications and wood tests. Other recommendations related to the control of varieties, combating parasites, and studies on consumption. The results of this work, together with the recommendations, are embodied in the final report of the Commission.

Members of the Commission and numerous guests took part in a research tour organized by the Ministry of Agriculture and Forests in the Valley of the Po. Among the organizers of the tour were Professor Pavari, Director of the Institute of Silviculture in Florence; Professor Piccarolo, Director of the Institute of Experimental Poplar Cultivation; and Professor Giordano, a member of the General Forestry Administration in Rome. Industrial firms of northern Italy also contributed to the organization of the tour and their engineers spared no pains to provide the members of the Commission with information.

In the course of the tour, members of the Commission sought to identify the species of poplars they saw, studied the different uses of poplar wood, and identified the diseases and insects that cause most serious damage to plantations.

Identification of Poplars

While traveling across the Piedmont, Lombardy, and Venetia, the Commission identified poplars and sought to ascertain their origin. To achieve this purpose, the Commission examined some of the original types, indigenous and foreign. The introduction of the latter into Italy dates back probably to the end of the 18th century. The Commission went to the shores of Lake Maggiore at Leso, where they saw two superb specimens of the black variety, both male and female, in the park of Morra of Lavriano, near Villa Stellone. In this park there is a collection of magnificent poplars centuries old among which are *Populus alba, P. carolinensis* (male and female), and numerous hybrids in which the characteristics of *P. serotina, angulata, marylindica, virginiana,* etc., can be recognized. Members of the Commission also examined a magnificent black Italian poplar, *carolinensis,* on the grounds of a villa near Torviscosa, the circumference of which reached 4.42 meters.

Among the various industrial stands they visited few were of a pure type; most were a mixture of hybrids. It appears that the method adopted by industrial users has been maximum utilization of natural hybrids without waiting for the result of experiments. This method appears to have been largely successful. It has certain disadvantages, however, because the requisites for successful poplar culture are not always realized under natural conditions, and the hybrids produced are not necessarily the best.

Mr. Régnier, who is a director of research in agronomy and a member of the Commission, considers that three poplars have played a fundamental part in the hybridization: the black poplar, which is still abundant in the valley of the Po; the *carolinensis,* which was introduced from France in both types, male and female; and a Canadian poplar, which must be the *virginiana* judging from the leaf shape of hybrids derived from it. It seems that in Lombardo-Venetia the black poplar and Virginian poplar were predominant, while in Piedmont the influence of *carolinensis* was more marked. The characteristics of the black poplar of the pyramidal variety were also very noticeable.

While examining these industrial stands, the Commission also paid attention to the natural stands of black poplars between Bolzano and Trentino in the Adige Valley, where natural seedlings were observed. Other stands derived from sowings were inspected, such as those at the Villafranca School, in which the diversified origins of the trees are noticeable. These have been established in very favorable soils and produce trees that are exploitable in 12 to 15 years. In some cases they reach dimensions exceeding 2.3 meters during that period. The Commission visited the Experimental Station at Casale Monferrato, where careful research in the field of hybridization is being carried out. Special efforts are made there to find breeds that grow rapidly and are resistant to defoliation caused by parasites. The character of certain clones, Nos. 154, 214, and 455, answering these qualifications, was ascertained.

Utilization of Poplar Wood

The Commission inspected the principal industries using poplar wood in

Two-year-old plantation on the Zoppa estate, Stagno Lombardo. Defoliation is caused by parasites.

The Pineda Forest belonging to the SAFFA. Section of a hybrid poplar tree showing the Carolina poplar influence.

northern Italy. These are mainly mechanical pulp and plywood factories. Mechanical pulp plays a very important part in newsprint, since it forms 75 percent of its total components. As regards plywood, whether made of poplar only or with an external ply of hardwood, it is in great demand in all building operations. The most used type for this purpose is the black poplar or hybrids derived from it, while the white poplar is not used at all, being mechanically unsuitable for veneer peeling.

The present consumption of poplar wood in Italy is estimated to be about 1 million cubic meters, but it is not yet sufficient to meet Italy's needs in mechanical and chemical pulps. In Italy, poplar wood is used, of course, for many other purposes, including the production of matches, packing cases, clogs, lumber, etc.

Diseases and Insects

In Italy, the poplar is free from certain diseases which are endemic in neighboring countries; it is especially resistant to the dripping canker. Certain stands, however, are affected by parasitic defoliation, and the Commission also noticed a number of massive attacks of sawfly in the forests of the SAFFA at Stagno-Lombardo.

Research on parasitic defoliation is being actively pursued under the guidance of Professor Piccarolo, of the Experimental Station of Populiculture at Casale Monferrato.

The poplar is closely related to the whole Italian agricultural economy. It is used to improve health conditions in swampy lands, as in Venetia, it is grown on certain parts of the Adriatic coast swept by salt winds, it is used as a wind break between cultivated fields in the whole of northern Italy, it is a means of utilizing to great advantage the alluvial plains of the Po. In the rice fields of the Piedmont, poplar is closely related to the cultivation of this grain, since the annual flooding of the fields produces the necessary moisture for the growth of the tree. Even in industrial plantations, where trees are exploited on a 15-year rotation, lucern and maize are often planted between the rows during the first five years. Experts consider that in Italy any planting of poplars not integrated to crops would be irrational.

Forestry and Forest Products at the FAO Annual Conference, 1948

The Council of FAO (World Food Council) met in Washington 17 to 20 August to consider with the Director-General the advance preparations for the Fourth Session of the Conference to be held in Washington. Since then the Division of Forestry and Forest Products has been actively concerned with the other divisions and services of FAO in bringing these preparations to completion.

The Agenda for the Conference includes:

1. Annual review of the world situation and outlook in respect to production, marketing, and consumption of food, agricultural products, fish, and timber.
2. Consideration of the technical activities of FAO during the preceding twelve months, and its program of action for the ensuing year.
3. Discussion of major constitutional, administrative, and financial issues, particularly of the budget for the next fiscal year.

The Conference may choose to assign consideration of these subjects to three Commissions, as at Geneva last year. In that case, Commission I will probably be the body concerned with the World Food and Agriculture situation, and its work is likely to center on two basic documents prepared by the FAO secretariat, both of which contain a considerable amount of material supplied by the Division of Forestry and Forest Products.

These documents are entitled *The State of Food and Agriculture, 1948*, a survey of world conditions and prospects, and *National Progress in Food and Agriculture Programs*, a summary and analysis of the annual Progress and Program reports submitted by member governments in compliance with Article XI of the FAO Constitution.

The first of these documents is addressed not only to the FAO Conference but also to the general public. In spite of limitations and imperfections due to inadequate data, it delineates the central issues clearly enough and shows, firstly, that much more is being done to expand production around the world than is generally realized; secondly, that what is being done, although so noteworthy, is far from sufficient to make any significant improvement upon the living standards of most peoples.

Apart from being treated in the general world review of the current situation and trends, forestry and forest products are dealt with separately under the regional breakdown adopted in the document. In the chapter on commodity situations, the current position with regard to the major forest products is discussed, including sawn lumber, pulp and paper, pitprops, railway sleepers (cross ties), plywood, and fiberboards. Finally, under the section on "Tools for Production," forestry equipment is given brief consideration.

Self-sown stand of 14-year-old trees at the Technical College, Villa Franca. Average volume of trees: 2 m³.

In *National Progress in Food and Agriculture Programs*, forestry and forest products are dealt with particularly in Chapter V, which discusses Improvement of Forest Legislation and Administration; Improvement of Forestry Educational Facilities; Expansion of Forestry and Forest Products Research; Improvement of Forest Inventories; Increased Reforestation and Extension of Areas under Systematic Working Plans; Trends of Production and Improvement of National Supplies; Trends in Industrial Capacity; Relationship Between Volume of Fellings and Annual Growth.

Only those countries which actually reported to FAO are treated, and therefore perhaps a too fractional and unbalanced picture is presented of world progress in forestry.

A second Commission will presumably be concerned with the technical activities of FAO. The basic document in this case will be the *Work of FAO, 1947/48*, the report of the Director-General to the Fourth Session. In this document the activities of the Forestry and Forest Products Division are concisely dealt with. Supplementing the report, certain other documents will be available, such as the report of the Latin-American Forestry Conference at Teresopolis, the report of the European Forestry and For

est Products Commission, the FAO Year book of Forest Products Statistics, *Forest Resources of the World*, current issues of UNASYLVA, and reports of the FAO/-ECE Timber Committee.

The Commission will also have before it the draft *Program of Work for 1949*, together with an appraisal of the means and resources to carry it out. In this document, the program of the Forestry and Forest Products Division reflects a selection, approved by the Standing Advisory Committee, of the most urgent tasks from the many that the Division should be undertaking, if funds and staff were available.

The division will, of course, be actively concerned in the proceedings of the Conference. It expects to gain guidance from the Conference discussions and decisions as to the pattern of its work program and the relative priority of its projects. Particularly the division hopes for co-ordination of its regional efforts, so that the evolution of its world forest policy may be carried a stage further.

The Third Meeting of FAO's Committee on Wood Chemistry

FAO's Committee on Wood Chemistry held at its third meeting in Cleveland, Wisconsin, U.S.A., on 14-15 August 1948, under the chairmanship of Dr. H. Mark, Director of the Polymer Research Institute at the Polytechnic Institute of Brooklyn. The following delegates attended:

Belgium.—J. Istas, Chemical Research Laboratory, Ministry of Colonies, Tervuren

Canada. C. Greaves, Forest Products Laboratory, Ottawa

United Kingdom. W. G. Campbell, Officer-in-Charge, Chemistry Section, Forest Products Research Laboratory, Princes Risborough

Netherlands. J. Al, Director of Patents Department, T.N.O., The Hague

Sweden. H. G. Erdtman, Institute of Technology, Stockholm; Mrs. G. Aulin-Erdtman, Swedish Forest Products Laboratory, Stockholm

United States. J. A. Hall, Director, Forest Service Pacific Northwest Forest and Range Experiment Station, U. S. Department of Agriculture, Portland, Oregon; E. C. Jahn, Professor of Forest Chemistry, New York State College of Forestry, Syracuse; H. F. Lewis, Dean, The Institute of Paper Chemistry, Appleton, Wisconsin; R. C. MacDonald, Secretary, Technical Association of the Pulp and Paper Industry, New York; A. J. Stamm, Forest Products Laboratory, Madison

FAO. P. Terver; N. de Felsovanyi

The agenda included a report prepared by G. I. Drake of the Simpson Logging Company, read and commented upon by Dr. Hall, which dealt with endeavors by a number of companies on the West Coast to integrate the forest industries of the western United States. Mr. Terver reported on the installation of integrated wood operations in the tropical regions.

A lengthy discussion followed on the development of "forestry combines," mainly in undeveloped areas.

The possibility of educational exchanges in the field of wood chemistry was developed in a report presented by Professor Jahn. Various suggestions were made by delegates for a more extensive exchange of teachers, students, and literature. Special questionnaires are to be prepared and sent out by FAO, which when completed will list institutions, experts, and existing facilities in the field of wood chemistry.

Mr. MacDonald presented a paper on nomenclature, testing and specifications. In close collaboration with competent national organizations, FAO is to prepare a nomenclature establishing the standard usage of technical terms.

The chairman, Dr. Mark, reviewed the work done during the second meeting of the Committee, held at Geneva on 14-15 May 1948. He then gave a general outline of the work being done by noted European experts in wood cellulose chemistry.

A plan to hold a World Chemistry Congress in Stockholm during the summer of 1949 was disclosed by Professor Erdtman of Sweden. Precise details were not worked out, but it was decided to hold the next meeting of FAO's Committee on Wood Chemistry in Stockholm in conjunction with the World Chemistry Congress.

Finally, the delegates unanimously adopted the committee's program of work for 1948-49 as presented by the secretariat. This includes a number of detailed studies of technical and economic questions and general surveys of chemical industries in connection with FAO's work project for the development of "forestry combines," especially in undeveloped areas. Special attention will be given to the study of processing heterogeneous mixtures of species such as are found, for instance, in tropical regions, since the possibility of utilization of their woods in mechanical industries is limited.

The possibilities of exchange in research and education are to be thoroughly explored. The drafts of the questionnaires proposed, relating to research facilities in wood chemistry, are to be drawn up by the secretariat and submitted to the committee for final approval.

Inter-American Conference on the Conservation of Renewable Natural Resources

This Conference was held by the Government of the United States at the request of the Pan-American Union at Denver, Colorado, U.S.A., 7-20 September 1948.

The President and first Vice-President elected by the Conference were Charles F. Brannan, U. S. Secretary of Agriculture, and Pedro Castro Monsalvo, Minister of Agriculture and Animal Industry for Colombia.

The Conference was attended by delegations from all the Latin-American countries and the United States. Canada, ECOSOC, UNESCO, FAO, Inter-American Economic and Social Council, Pan-American Union, and Inter-American Institute of Agricultural Sciences sent observers. FAO observers were J. D. B. Harrison of the Division of Forestry and Forest Products and J. L. Buck of the Agriculture Division. In addition, there were numerous authors of papers and observers for conservation societies in attendance.

In several cases the delegations were headed by ministers of agriculture or directors of agricultural services. Senior forestry officials from Brazil, Venezuela, Cuba, Mexico, Argentina, and the United States were members of delegations. The total number of Latin-American representatives was close to 100.

The Executive Vice-President, Mr. Kelchner of the U. S. State Department, and the Secretary-General, William Vogt of the Pan-American Union, were appointed by the President of the United States. They were assisted by officials of the State Department in making arrangements for the Conference.

The opening and closing sessions of the Conference were held in the State Capitol, and the final meeting was addressed briefly by President Harry S. Truman. According to the program, the main work of the Conference was organized in six sections, but, in fact, each "section" represented one day's meetings of all the delegates. Twelve to 14 papers were delivered each day, and, since all of them were read in extenso, there was not much time for discussion. Motion pictures on conservation were shown in the evening. The organization was excellent and attendance at all meetings was remarkably good although the program was heavy.

Four field trips were arranged to the Arapahoe and Pike National Forests, the Rocky Mountain National Park, the Cherry Creek Soil Conservation District, and the one-day remodeling demonstration of the John Race farm in the Cherry Creek region. The latter demonstration was spectacular, with probably half a million dollars worth of equipment in simultaneous operation. It is to be hoped that the use of so vast an array of high-powered machines to carry out relatively simple conservation measures will not discourage representatives of underdeveloped countries from attempting similar tasks with more modest means.

The reports presented at the Conference were, for the most part, of a general nature. They discussed the pressing need for conservation in terms of population pressure, soil erosion, and related aspects.

The discussions on "Renewable Resources" and "International Relations" were of particular interest. In the final three papers Dillon S. Myer described the work of the Institute for Inter-American Affairs; Secretary Brannan outlined co-operation between the United States and the Latin-American countries; and Carlos Fynn, Chief of Soil Classification and Conservation for Uruguay, recommended the establishment of a new organization, which might be called the Inter-American Natural Resources Conservation Administration and which should depend on some existing international organization. The actual work that FAO is doing in Latin America was outlined for the information of the delegates, and special reference was made to the Latin-American Forestry and Forest Products Conference held at Teresopolis, Brazil, in April 1948. Statements were heard from the Pan-American Union,

Inter-American Economic and Social Council, and the Inter-American Institute for Agricultural Sciences. It seemed to be the feeling of the delegates that co-ordination of the work of existing organizations would have to be carried further. Consideration of this point was referred to a subcommittee, consisting of representatives of a number of countries and organizations, which made preliminary recommendations to the Resolutions Committee.

The resolutions adopted by the Conference included a recommendation for the establishment of a joint committee, representing the Pan-American Union, FAO, and the Inter-American Institute for Agricultural Sciences, to co-ordinate conservation activities in Latin America. Governments of the countries represented at the Conference were called on to assure rational use of their forests, in accordance with the recommendations of the Latin-American Conference on Forestry and Forest Products.

It seems likely that the technical sections of the United Nations Scientific Conference on the Conservation and Utilization of Resources, which is to be held next spring, and which will be devoted to the exchange of experience in the application of conservation techniques, will be a fitting sequel to the Denver Conference in so far as the Latin-American countries are concerned.

Reconvened Third Session of FAO/ECE Timber Committee

The third session of the Timber Committee was reconvened at Geneva on 13 September, under the chairmanship of Bernard Dufay (France). Delegations of fifteen European countries and the United States of America met to continue their efforts to secure the export of additional timber through 1949, 1950, and 1951 against the supply of equipment for timber-exporting countries.

Importing countries willing to supply the type of equipment needed by the timber exporters included Belgium, Denmark, France, Hungary, Italy, Netherlands, Switzerland, and the United Kingdom. Discussions revealed that a considerably greater amount of equipment was available in Europe than had been anticipated on the basis of earlier calculations.

Delegates of countries seeking equipment came from Austria, Czechoslovakia, Finland, Poland, and Yugoslavia. Sweden is not asking for equipment and the Swedish delegates were in a position to offer such supplies. Luxembourg was also represented. The International Bank for Reconstruction and Development was represented by Mr. Schmidt and Mr. Stephens of the Loan Department and Mr. Nurich of the legal staff, while Marcel Leloup and Egon Glesinger represented FAO.

Agreement was reached on important aspects of the plan. Final details remain to be settled, however, between individual countries and with the International Bank.

Industrial Development and Trade in Europe

The third session of ECE, acting on the initiative of the Soviet delegation, directed the attention of governments to the problems of increasing European production and trade through co-operative action.

To study these problems, ECE created an ad hoc committee on Trade and Development, and the secretariat produced a report to assist this committee in its deliberations. While tentative in its suggestions, the report presented a constructive analysis of the possibilities. The staff of FAO's European Forestry Working Group at Geneva contributed to its preparation by producing a study of the problem of timber development in Europe.

The main way in which international action can be effective in developing higher productivity in Europe lies through increases in trade between the less developed and the more industrialized countries, which, with exceptions, implies countries of eastern and western Europe. West Europe has for a long time constituted the greatest timber market in the world, with the United Kingdom by far the most important individual buyer. On the other hand East Europe has timber resources which, after food products, offer the most important means for an exchange of trade. It is for this reason that FAO, with ECE, has striven to stimulate the flow of timber products, particularly sawn softwood, from east to west. The FAO/ECE Timber Committee recognized that increased imports of capital equipment would be required before an expansion of production could take place, hence its great interest in the forestry equipment procurement scheme mentioned elsewhere in this issue.

Beyond this scheme, however, all countries of central and eastern Europe attach great hopes to the development of integrated forest industries ("forestry combines") and one or several units are included in certain national development programs. There can be little doubt that they could fill a real need in Europe's economy, and would reduce dependence on imports from overseas. This applies not only to timber, pitprops, and pulp, but particularly to the new products of forest industries such as fibers, alcohols, and food concentrates.

One of Europe's basic troubles is that it has never used its resources to full effectiveness, as the ad hoc committee recognized at its meeting at Geneva in September. The main result of this meeting was the setting up of a special committee for the development of inter-European trade. It is to be hoped that, through the efforts of this committee and of the existing commodity groups within ECE, a fuller utilization of European resources will become possible, which will help reduce Europe's general deficit in overseas payments.

UNESCO Discusses the Newsprint Situation

At the August meetings of UNESCO's Commission on Technical Needs in Paris, some time was devoted to consideration of the report of the Press Sub-Commission on the newsprint situation.

UNESCO's procedure in sending experts into various key countries to make personal investigations has yielded excellent results, and the organization probably possesses at present the most complete and up-to-date information on newsprint.

The Press Sub-Commission, in its report, stressed the continuing serious world shortage of newsprint, which tends to hinder freedom of expression.

Although this over-all shortage is decreasing gradually as production recovers from wartime dislocations, the output in many countries is still far below the full capacity of the mills. This idle mechanical capacity results mainly from a shortage of necessary raw materials, which in some cases are not being produced or cannot be purchased because of currency restrictions. In some cases pulpwood or wood pulp is being diverted to other purposes and newsprint mills are being used for other production.

In the opinion of the Sub-Commission, the necessary increase in production could be achieved without undue delay by restoration of all idle capacity to full production.

The Sub-Commission therefore recommended that a) top priority should be given to the production of newsprint, b) the attention of other international bodies should be drawn to the prime importance of newsprint and to the prevention of the diversion of pulpwood to other uses and, finally, c) UNESCO should enlarge its surveys regarding newsprint production, consumption, manufacturing policy, prices, taxes, and trade regulations, in conjunction with organizations and associations working in the same field.

Roy Cameron, Chief of FAO's European Forestry Working Group, attended the UNESCO meetings to represent FAO's interests. The need for co-ordination of policies among the interested international agencies is recognized, particularly in the collection of statistics on pulp and newsprint. The Commission on Technical Needs recommended that the question be referred to FAO's forthcoming preparatory conference on wood pulp problems. UNESCO will be represented at this conference.

News of the World

The items appearing here are condensed selections of news thought to be of interest to readers of UNASYLVA. *They are grouped alphabetically by countries under headings currently used by the Division of Forestry and Forest Products for reference purposes. The Editor will be glad to receive direct from readers authenticated items of interest and of news value for this part of the review.*

General

AUSTRALIA

The Ministry of Public Education in the State of Victoria has developed elementary forestry education in the schools to a remarkable extent. Under the terms of the School Endowment Plantation Scheme each school may be granted a piece of forestland, the care of which is assumed by the school children. There are now 350 such forest stands maintained by 420 schools, most of which are of less than 3 ha (7 acres) although some are more than 18 ha (46 acres). The total area allotted is about 1,200 ha (3,000 acres). The school forests are generally plantations of *Pinus radiata* which were established by the schools themselves and in which clearing is now being done by a new generation of school children. The areas are Crown lands placed at the disposal of the schools, land supplied by municipalities, or land purchased by committees of school teachers appointed to take care of the stands, with the help of regional foresters. Consequently, from their very earliest youth children are trained by their teachers to respect and love trees, as they acquire at the same time basic principles of silviculture.

AUSTRIA

The Vienna Hochschule für Bodenkulture (Academy of Agriculture and Silviculture) celebrated its 75th anniversary on 31 May this year, in the presence of the authorities, delegates from various countries, and high Austrian officials.

CANADA

Monsignor Labrie, Bishop of the Gulf of St. Lawrence, has addressed a pastoral letter on forestry to his clergy and diocese. This was hailed by the foresters of the Province of Quebec as an "alarm warning of the catastrophe towards which we are heading despite all our science. It also serves as a survey pointing out the faults and indicating the remedies to be taken in order to halt our unpardonable prodigality." After paying homage to the efforts made by a great number of teachers, technicians, and organizations that have devoted their efforts to the science of forestry, Msgr. Labrie stated that in practice the same destructive methods are still being used. If there is any progress in mechanization, it is still directed towards destruction. In a comparison of the conditions prevailing among forest workers in Sweden and those of the Canadian county of Saguenay, he points out that in Sweden workers are encouraged to make their home in the forest, but in Saguenay forest workers move from place to place, appear to have lost the desire to establish homes for themselves, and only think of squandering their earnings.

PORTUGAL

In 1947/48, the Junta Nacional da Cortiça (National Cork Asociation), in collaboration with the Water Supply and Forestry Department, the agricultural unions, and forest owners organized successful courses for cork-growers and owners. Despite certain difficulties, ten study series were given in various regions. Workers and farmers declared that the silvicultural methods and scientific techniques presented were highly satisfactory.

UNITED STATES OF AMERICA

The Pacific Northwest Experiment Station at Portland (Oregon) has just announced the creation of a new forest research center to be organized by the Blue River Experimental Forest, a portion of the Willamette National Forest. This experimental forest of 6,000 ha (15,000 acres), which is composed of a virgin stand of Douglas fir of various ages, will be used in a study of the progression of forests from the virgin state to that of sustained-yield management as this applies to the Pacific Northwest. The influence of the forest on watershed climatic conditions will also be examined. For this purpose, close co-operation will be maintained with the Experiment Station of the United States Army Engineers which is studying the phenomena of snow melt and variations in the flow of water on an area of 2,000 ha (5,000 acres) of adjacent forest lands.

Dr. Frans Verdoorn, managing editor of *Chronica Botanica*, spoke on 17 June before the Southern California Botanical Society, at the Rancho Santa Anita, near Pasadena, on "The Modern Arboretum, a Center of Regional, Botanical, and Horticultural Synthesis." Dr. F. W. Went, Professor of Biology at the California Institute of Technology, and chairman of the trustees of the Los Angeles County Arboretum Foundation, outlined the plans of this foundation which will develop a modern arboretum of 46 ha (114 acres), with educational, horticultural and research departments at the site of the historic Reid and Baldwin estates, Rancho Santa Anita.

Fundamental Science

BRAZIL

André Aubreville, a member of the French delegation at the Latin-American Conference on Forestry and Forest Products held at Teresopolis and expert on African forestry, has made a study of the Parana pine and the eucalyptus plantations, which are so important to Brazilian forestry. His recently published notes are all the more valuable because they compare conditions in Brazil with those of tropical Africa.

His findings confirm that, in the region of the Parana pine, *Araucaria angustifolia*, there exists, paradoxically, an industry which is compelled to restrict production drastically at a time when the export of its products would be of tremendous importance for the industry's own development and to relieve the global shortage of softwoods. This situation arises from the lack of transportation facilities, which are difficult to develop because of the rugged conformation of the country.

Production for export in the four southern states, where most of the pine resources are concentrated, is being limited to 330,000 m^3 per month, whereas the production capacity of the sawmills is said to be 732,000 m^3. Total production of sawn pine amounted to more than one million m^3 in 1947. Taking into account the production of the pulp factories, including the large one at Monte Allegre, in the state of Parana, as well as that of the plywood factories, this means hardly more than a total exploitation of from 4 to 5 million m^3 (r). Compared with the total acreage of pine forests, estimated to be nearly 28 million ha, and working on the supposition that the density of these stands does not average more than 48 m^3 per hectare, the minimum figure mentioned by Mr. Aubreville, this is an extremely small total.

Unfortunately, exploitation does not generally follow rational silvicultural practices. A great deal of research needs to be done on the ecology and biology of the pine before better results can be achieved. Some of the private companies and the Instituto Nacional de Pinho (National Pine Institute) actively encourage artificial regeneration but this work is not yet generally or systematically carried out. The Institute, which is entrusted with the study of economic and silvicultural problems of the pine forests, is very active and has considerable financial resources at its disposal. Its work, however, is hampered by the fact that most of the Parana pine forests are privately owned.

Mr. Aubreville was particularly interested in the manifold problems of the Parana pine forests and the present state of the *campos* which surround them. Under the tall pine stands, which are, as a rule, fairly sparse, there is a dense and varied understory of hardwoods in-

cluding some species of great commercial value. Natural regeneration of the pines is therefore practically impossible. It would be interesting to know how the pines originally established a foothold under such conditions. Mr. Aubreville apparently favors this explanation of the proliferation of the Parana pine: a dense Indian population once lived on the plateau of southern Brazil and the repeated fires they set, and which the thick-barked pine trees resisted very well, had its influence on the *campos* and on the general appearance of the countryside.

The eucalyptus plantations in the state of Sao Paulo, which Mr. Aubreville also visited, are the achievement of an enthusiastic pioneer, Armanda Navarro de Andrade. Their establishment was essential because of the total deforestation of this region, in which agricultural development was extraordinarily rapid. In less than four centuries the forest cover had been almost completely destroyed. Despite the success of these plantations, and the economic benefits derived from them, Mr. Aubreville warns: "Such success might entail certain dangers later on, if the Brazilian forest service, hypnotized by the eucalyptus, does not pay sufficient attention to the protection of the local flora, which from the standpoint of soil conservation and improvement play a much more effective role than the eucalyptus itself."

NYASALAND

The report of the Director of the Forest Conservation Service of Nyasaland for the year 1946 includes, besides a brief historical account of its development and activities, interesting data on this territory, which possesses large forest stands of *mlanje* cedar, *Widdringtonia whytei*, one of the principal native softwoods of Central Africa.

Fire is the main danger to the forests of Nyasaland. It sweeps through large areas every year except for small stretches of closed forests, such as the softwood forests of the Mlanje Mountain and certain protected plantations. Early burning is practiced over a large area of wooded savanna, but because of the total lack of supervision it cannot be said that this constitutes any marked improvement over native practices. The year 1946 was one of particularly serious fires.

The most valuable woods of Nyasaland, such as the *mlanje* cedar, the *Podocarpus mlanjianus* (yew family), the *Piptadenia buchananii* (mimosa family), and the Nyasa *khaya*, *Khaya nyasica*, reproduce abundantly and naturally. This is not true of the Angola *padauk*, *Pterocarpus angolensis*, the natural and artificial regeneration of which present a problem that has not yet been solved.

A vast range of exotic softwoods can be successfully planted in Nyasaland. The slash pine, *Pinus caribaea*, the longleaf pine, *Pinus longifolia*, and the Monterrey pine, *Pinus radiata*, are used to a large extent, but the area devoted to the *mlanjiccdar* can also be extended considerably. Among the broadleaved trees, the Nyasa *khaya*, the *Piptadenia buchananii*, and the Iroko, *Chlorophora excelsa*, grow well in plantations. The Sydney blue eucalyptus, *Eucalyptus saligna*, covers large areas, among which is the vast privately owned forest of the Imperial Tobacco Company, which has its own sawmill and seasoning kilns.

Silviculture and Management

CANADA

Co-operative study of a scheme of regular management to ensure the sustained yield of a forest area of 1,000 km^2 (400 square miles) has been organized in the Green River Basin of New Brunswick, north of Edmundston. The survey is carried out by a working committee on which are representatives of the owner company, the New Brunswick Ministry of Lands and Mines, the Dominion Forestry Service, and the Entomology Division, Canadian Ministry of Agriculture. The study began with entomological research because it was of first importance to combat the spruce budworm, *Cacoecia fumiferana*, which causes considerable damage in this region. Cutting is now directed solely by consideration of which stands are most likely to encourage propagation of the insect. These stands, which must be exploited first, are old stands containing a large proportion of overage balsam pine, *Abies balsamea*. The objective is to establish practical data for future forest management plans. In addition to the careful study of forestry methods most likely to give satisfactory results, greatest importance is also attached to control and inventory methods. Work on these two problems is carried out from two different angles: The general plan is to maintain an up-to-date card index of the forest stands and inventories, based on large-scale work in soil sampling and aerial photography. Commercial value is given to all existing trees that are alive. Reduction coefficients to be applied to exploitation waste will be determined directly by utilization studies carried out by the owner company and the Forest Service. The detailed plan aims to ascertain the extent of the various changes in the forest as a result of felling, windfall, disease, insect blight, decay, and increase. Five experimental plots of 10,000 km^2 (4,000 acres) each have been established for this purpose. They will be surveyed every five years by a tight system of sampling.

CHINA

The National Forestry Research Bureau of China has planted seedling trees on 1,429 ha of denuded and dangerously eroded hill country in the Nanking region. Nearly 5,200,000 seedlings were planted, of which approximately 90 percent are expected to survive. They were furnished almost entirely by forest nurseries at the bureau's experiment stations. The species used were mainly Chinese and Japanese pines. Four softwood trees were planted to one hardwood. Manpower was supplied by 600 refugee laborers. Protection of the plantations is important in this area, because the inhabitants, who are extremely short of fuel, are in the habit of cutting tiny trees as soon as they can be used as firewood. Strict regulations will ensure protection. Among the measures envisaged is one permitting only grasses and weeds to be used as fuel during the next five years. A special forest protection police force will be set up to enforce these measures.

It is thought that similar op[illegible] in the Nanking area will cover 13,7[illegible]

FINLAND

The Forest Service is devoting much of its time to draining swampy forest soils. One of the five sections of the Management Branch deals only with this important question. A total of 9,600,000 ha is classified as actual marshlands. Drainage is undertaken where it alone will ensure natural regeneration and growth. This can be determined fairly accurately by a preliminary examination of soil and vegetation. Generally speaking, the birch is the first to grow on drained lands. It improves the fertility of the land so rapidly that spruce, fir, and pines can later flourish. Experiments, some of which already go back several decades, with stands at the first thinning stage, show that there are probably 2.8 to 3.2 million ha that can be reclaimed. Unfortunately, manpower and funds are insufficient to carry out this work on a large scale. Before the war, the state subsidized drainage in private forests, paying up to 60 percent of the costs. During the first five years of operation, 96,000 ha were reclaimed.

SWEDEN

Alkaline chlorates have long been used to combat harmful plants. However, recent experiments carried out in Sweden and in the Soviet Union have caused renewed interest.

Chlorate treatment has been used in Sweden to prepare sites for natural regeneration of forests. This has proved of particular value when followed by surface burning, especially where there is a growth of *Vaccinium* spp. and *Ledum palustre*, which spread and reproduce vegetatively. The application of chlorates followed by burning also seems to give excellent results in drained peat or marsh lands. Vigorous seedlings of Scotch pine and birch appeared following this treatment, whereas previously the land had produced only deformed and sparsely growing pines. On the other hand, burning seems to be inadvisable for land covered with *Calluna*, which reproduces by seed.

In Russia, chlorates have been used in forest nurseries and on small forest areas which are in the process of natural or artificial regeneration. The results show that, in addition to effective control of the herbaceous vegetation and even of the root suckers of certain trees, doses of from 1 to 5 grams per square meter also improve the growth of seedlings and young plants. The chlorates activate the decomposition of plant residue, stimulating microbiological activity, especially promoting ammonification and nitrification. This last is all the more important because in acid soils—and the majority of forest soils are acid—nitrates are the best source of nitrogen for plants. In experiments carried out in forest nurseries, deciduous trees reacted best to chlorate treatments: The air-dry weight of young oak, ash, elm, and maple trees was multiplied from 2.5 to 3, and the air-dry weight of the aerial portions multiplies 4 or 5 times and leaf size from 1.5 to 3 times. In a mixed stand of spruce and hardwood plots treated with chlorates in doses of from 3 to 5 gr per m^2 regenerated much quicker than the

untreated control plots. During the five or six years of the experiment the growth of seedlings was from three to four times faster. Doses of from 1 to 2 gr per m^2 caused no injury to young trees and shrubs of more than two years, provided the aerial portions did not come into direct contact with the solution. On the other hand, in those parts of the forest apt to be invaded by perennial herbaceous weeds, the use of chlorate in too small doses may stimulate their growth instead of destroying them.

UNION OF SOVIET SOCIALIST REPUBLICS

According to a Russian press release, it was noted that during the last drought year in Russia the production of wheat in the heavily wooded regions was from 50 percent to 70 percent higher than that of the area which had no forests. It was further noted that in the region of the steppes, where the fields are protected by shelterbelts, wheat production was twice as high as in other areas. Soviet authorities have therefore decided to plant orchards, tree screens, or even actual forests in the agricultural regions of the steppes to serve as windbreaks. It is proposed that from 4 to 5 ha per 100 in treeless regions be afforested. This would increase the wooded area of Soviet Russia by five million hectares.

UNITED STATES OF AMERICA

Cork-oak plantations in California date back to 1855. There are now approximately 5,000 trees more than 10 years old. The acorns have high germinating capacity and can be preserved for 12 months if kept at a temperature of from 3 to 4° Centigrade with proper humidity. It is possible to obtain an annual production of from 5 to 10 tons of acorns with a yield of 150 acorns to the kilogram. During recent years 200,000 young plants were distributed to landowners, of which 50 percent took root. In the course of the last few years, harvesting tests of the bark have been made. It was found that the best time is from the beginning of July to the beginning of October. Although the trees were stripped for the first time, the cork was found to be of sufficiently good quality for most articles of current use. The regrowth of the bark is very rapid and produces cork of excellent quality. Trees from 25 to 30 years of age produce, following the removal of the first layer, an average of 45 kilograms in five years. The stripping of the first cork can start when the tree is 20 years old. If distribution of young plants can continue until at least a million trees are growing in California, the state could, within 30 years, count on a reserve of 50,000 tons of cork.

A large-scale experiment is being conducted in the Cascade Head Experimental Forest on the Oregon coast, in close cooperation between the U. S. Forest Service and a large industrial firm. Five plots which will yield about 34,400 m^3 (r) (7,600,000 board feet) of timber have been sold to the firm for normal exploitation, but the trees to be felled have been marked in order to carry out specific silvicultural practices. The object is to determine how far it is possible to apply to this type of forest (regular mixed stands of 90-year-old *Tsuga* and *Picea*) certain methods of cutting specifically designed to ensure a sustained yield. The first plot selected for exploitation comprises 17 ha (42 acres) situated astride a hill crest and intended for "high lead" clear-cutting. It is particularly intended to examine the effect of this method in relation to windfalls in comparison with the system usually adopted, which restricts felling on the crest. Two other plots will be clear-cut on stretches differently situated. Two others will be thinned, one by heavy crown cutting, the other lightly by cutting out suppressed undergrowth. Only light and very mobile exploitation equipment will be used in the last two cases. Results will show in a few years. However, interesting data on relative cost prices in regard to the various exploited plots, their recoverable yield, and on intensive utilization of products should become available with each cutting operation.

The recuperation of the spoilbanks of the open-cut coal mines of Pennsylvania for agricultural purposes or for forest lands constitutes a difficult problem which was discussed at a meeting held on 15 March 1948 at Pennsylvania State College. The regrowth of natural vegetation on these lands is generally extremely slow. The spoilbanks are ugly but, what is more serious, they are often subject to intensive erosion which endangers neighboring waterways. It is thought that the best possible utilization of these areas would be to reforest them. In Pennsylvania, the soil is characterized by extreme acidity and the abundance of sulphurous compounds which make it difficult to improve it for future agricultural use. Occasionally, however, reforestation occurs naturally near surfaces covered with trees or brushwood. The species that could be used are: pines in the dryer parts, spruce-fir, fir, and larch in the more exposed and better-watered areas. On less arid soils, broad-leaved species could be used, especially *Robinia*. Fairly close spacing is recommended to cover the ground as rapidly as possible. A certain amount of leveling is very often necessary for reforestation purposes, and precautions must be taken to ensure adequate drainage.

Mensuration, Increment, and Yield

CANADA

Experiments have been made recently by a large Canadian air survey company in using three cameras simultaneously, the middle one taking vertical views, while the two others operate obliquely. Particularly good results have been obtained with winter photography. One of the main advantages of this method is that the area covered in a single flight is very much wider, which considerably reduces the cost of aerial photographic surveys. The flight altitude, which can be lower, allows for a scale of 1 to 9,600 and enables more precise interpretation. While the determination of species and types of forest offers considerable difficulties with vertical photographs taken in summer, the oblique views taken in winter reflect the trees in silhouette and enable a much more precise and detailed distinction to be made. Photographs taken in winter also offer a much better opportunity to estimate accurately the proportion of both hardwood and softwood species in mixed stands. Also, the determination of heights can be made directly on oblique photographs by means of a transparent grid, which can be fixed to the stereoscope used to examine these views.

NEW ZEALAND

A general survey is being made of New Zealand forests. The object of this survey is to estimate or revise previous estimates of the total volume of forest stands and to gather a considerable amount of miscellaneous information on ecological conditions, such as the rate and extent of regeneration of the principal tree species and the extent of damage caused by wildlife and game. The survey units will obtain estimates of volume with a probable error not exceeding ± 10 percent. The survey is based on aerial photography. Vertical photographs are taken and a map is made on a scale of 4 inches to one mile. Sampling for determination of the average volume per acre for each forest type recognizable on the photographs is done by the use of regularly spaced lines on which rectangular plots of 1 acre each are established.

Detailed botanical and ecological data are recorded for a certain portion of each main plot.

Forest Protection

AUSTRIA

Remarkable success was achieved in April and May 1948 by spraying DDT from the air to combat the nun moth, *Lymenthia monacha*. This dangerous insect had been spreading through the valley of the Salza, probably since 1943 or 1944; however, it was not identified until 1946. By April 1948 the infested area had grown to 3,370 ha, with 21 centers of infestation. The spraying of DDT in a 5 percent solution of kerosene was carried out from 27 April to 15 May 1948 by the U. S. Air Force. The operation was made difficult by the mountainous nature of the country, the narrowness of the valley, the need to fly at heights between 30 and 45 m above the trees, and by the fact that favorable atmospheric conditions for spraying occurred only three hours each day, immediately after sunrise.

Despite these obstacles, 60,800 liters of the mixture were sprayed over the infested area, making an average of 18.4 liters per ha, or 0.92 kg of pure DDT per ha. The results obtained exceeded the most optimistic forecasts: the rate of mortality observed following the spraying was from 95 to 99 percent, depending on the location. No damage was caused either to fish or wildlife. The parasite which feeds on the nun moth, *Parasetigena segregata*, was also killed, but this could no doubt be avoided, since DDT retains its deadly effect for some 14 days, by spraying from 8 to 10 days before the emergence of the caterpillar.

CANADA

The exact nature of the disease attacking birch and wild cherry trees in northeastern North America, particularly in the Province of Quebec, has not yet been determined. R. Martineau has recently

published the results of his research covering the whole of the province. It appears that the proportion of trees attacked by this disease varies from 61.1 percent to 94.3 percent for birch in different parts of the province, and from 52 percent to 96.7 percent for wild cherry. The most seriously threatened region is that of the plains and the plateaus on the south bank of the St. Lawrence River and the Gaspé Peninsula, where the mortality rate has reached 60.2 percent and 67.7 percent respectively; the rate of mortality is high throughout the Province. It is not indicated whether the attack is more dangerous to exploited or to virgin stands. On the other hand, analyses of variation bring to light a clear relationship between intensity of disease and density of stand, decay of the tree being considerably more accentuated in sparse stands. A clear relationship also exists where age and average diameter of the stand is concerned, older trees suffering most.

The battle against forest fires achieved a measure of success in Canada in the years 1946 and 1947. Although the number of fires did not show a marked decrease, since the average for the previous 10 years was 5,508 and the figure for 1947 was 5,217, this is probably due to an increase of tourists, blueberry pickers, and forest workers, since industrial exploitation was especially active in 1947. On the other hand, the extent of the areas burned over by each fire decreased from an average of 180 ha. (450 acres) for the five-year period 1940-1944, to 69 ha (170 acres) for 1946 and 48 ha (120 acres) for 1947. The total area damaged in 1947 was 248,000 ha (613,000 acres) compared to a yearly average of 901,700 ha (2,228,000 acres) between 1937 and 1946. Carelessness of smokers (23 percent) and lightning (20 percent) caused almost half the forest fires. The third most frequent cause was campfires (15 percent). A factor in the year's battle was that climatic conditions were, generally speaking, favorable.

Large-scale salvage operations are contemplated in certain districts of Ontario, which suffered particularly from the forest fires of 1947, to save such timber as has not been rendered completely unusable. Aerial surveys have been made to locate the burned stands and determine the quantity of timber recoverable from each area. After being cut the timber will be skidded to the nearest lake where it will remain immersed throughout the winter and perhaps part of the next year to protect it against insects until it can be taken to the sawmills. It is probable that the firms holding timber rights will be compelled to cut the timber in damaged forestlands before resuming operation in virgin stands. It is also possible that some companies will be given concessions to salvage timber on crown lands.

Ceylon

According to the report of the Conservator of Forests for 1946, regeneration has been satisfactorily established and the parent overwood is now being removed in nearly all the experimental plots in the wet and intermediate forest zones. In the dry zone regeneration is difficult. Here "stick-cleaning" in the scrub jungle promotes establishment of such species as *ranai*, *Alseodaphne semecarpifolia*, satinwood, *Chloroxylon swietenia*, and *milla*, *Vitex pinnata*. "High-slashing" or cutting shrub growth at a convenient height instead of at ground level inhibits regeneration. Cleanings in unfenced plots must be carefully done if the desired plants are to be protected from grazing game animals. The year 1946 was also notable for a large-scale attack of predatory insects in the dry areas, which caused serious damage to valuable species. This may be a normal recurrence of epidemics but some foresters wonder if it may be the result of intensive spraying with DDT as an anti-malaria measure. The spraying may have affected the parasites feeding on the predatory insects more seriously than the insects themselves.

United States of America

In October 1947 disastrous fires swept the forests of New England. In the state of Maine, which suffered most, 81,000 ha (200,000 acres) of forests, exclusive of other land, were devastated by fire; the losses were 15 dead, 862 houses and 267 cottages destroyed, and 5,000 persons made homeless, and this is only part of the total. The primary causes were the climatic conditions prevailing at the time; however, various other causes contributed to the violence and rapidity with which the fires spread, and remedies are being sought for the future. There was delay in taking necessary precautionary measures such as prohibiting trespassing in the forests. There was lack of co-ordination among states, municipalities, counties, and larger communities within the state. There was inadequate radio communication, the only means of rapid communication after telegraph poles are burned down and telephone lines broken. Public appeals broadcast by government services attracted large numbers of curious to the neighborhood, blocking the roads and impeding the fire fighters. Local ordinances and regulations governing fire control are being scanned for revision and co-ordination. Better distribution of available manpower is being considered with a sufficient number of trained personnel to take charge in case of fires. The supply of fire-fighting equipment was insufficient, with no bulldozers and inadequate supplies of portable pumps and hose. Every community, however small or poor, it is now thought, should be equipped with at least one or more small forest pumps, a few hundred yards of hose, and some means of carrying water. It should also be possible to increase and develop natural water supplies in most areas. Finally, landing grounds located at strategic points, from which assistance by air can be obtained, should have adequate runways for larger planes.

One interesting development during the 1947 fires was the successful use of "wet water." This was done for the first time on a large scale, and proved extremely effective. Most of those engaged in fighting these fires were of the opinion that the damage would have been much smaller had sufficient quantities of "wet water" been available at the beginning.

The beaver has long been considered a useful animal in water conservation; in any case, its value as a fur-bearing animal was thought to compensate for any damage it might cause. This belief is being questioned. In northern Wisconsin, especially in Marinette County, the beaver has proved to be more destructive than fire. A study covering the ten-year period from 1938 to 1947 shows that land flooded as a result of dams built by beavers amounted to 680 ha (1,700 acres), causing total destruction of valuable stands of spruce, balsam fir, alder, and white pine, causing a loss of $11,617. Losses due to forest fires for the same period are placed at $7,442 for this area. The loss in productivity of the inundated lands is even greater. From 20 to 100 years may elapse before the land on which water has stagnated for a long period will regenerate naturally. Similar conditions were found in the states of New York, Michigan, and particularly northern Minnesota.

The terrible Columbia River floods of May 1948 caused serious damage to Vanport and Portland, Oregon, and other cities, as well as to industrial developments and farms. Forty lives were lost and 60,000 persons were left homeless. A commission of experts of the United States Forest Service was set up to study the causes of this flood and its effects upon the national forests located in the flooded zone. The Columbia River basin covers an area of 671,000 km^2 (259,000 sq. mi.), of which 101,000 (39,000 sq. mi.) are in British Columbia (Canada). It contains 31 national forests with a total area of 17,800,000 ha (44,000,000 acres), and constitutes the most important timber reserve in the United States. The commission found that very serious damage had been caused by the flood in a great number of these forests, washing away roads and highways, bridges and telephone lines, just a few weeks before the beginning of the forest-fire season, thus exposing vast areas to the danger of insufficient protection from fire. The magnitude of the flood was due to abnormal snowfall in the mountains followed by a late spring, prolonged rains, and a sudden hot spell which caused the snow to melt rapidly. The Commission found ample evidence that the water and snow could have been held back until the flood peaks had passed if millions of upland acres had not been denuded of forest cover. Forest fires have caused most of the denudation. In the national forests alone, more than 2 million ha (5,126,000 acres) have been destroyed by fire, most of this before 1935, when the Forest Service began to give intensive fire protection to these stands, previously considered of low value. Overcutting, grazing, farming, mining operations, and road construction work, too often carried on without thought of the damage caused to the forest and the soil, have also contributed. Present cutting practices and current methods of exploitation do not seem to have had any sizable influence on the recent floods. Nevertheless, methods which may be harmless at lower levels of the watersheds can be dangerous in the upper portions, especially on steeper grades or slopes. Observation has shown that forests have a retarding

effect on the rate of snow-melt. Fifteen days after the flood peak, particularly in high-altitude zones, timbered areas were still snowbound, whereas the neighboring denuded lands, even though normally cooler, had lost their snow-cover completely.

Despite the progress achieved in fire protection, damage caused by fire in 1947 was considerably greater than in 1946. A total of 200,799 fires burned over approximately 9,300,000 ha (23,225,932 acres) as compared with 172,278 fires which covered 8,300,000 ha (20,691,393 acres) in 1946. The damages for 1947 are estimated at more than $55 million. The 11 southern states were most seriously affected because the acreage burned over represents 11 percent of the forest land. Deliberate incendiarism was the cause of almost 23,700 fires. Only 0.8 percent of the lands under protection were burned over, whereas the figure was 18.1 percent for unprotected lands in the southern states.

Logging and Engineering

AUSTRIA

The use of the Wyssen cableway system was demonstrated in the Voralberg Mountains under the auspices of the Osterreichische Gesellschaft für Holzforschung (Austrian Timber Research Society). The capacity of a Wyssen cable system varies according to the ground it has to cross, between 25 m^3 par day on very difficult ground to 70 m^3.

CANADA

The discovery of a process for the barking of standing timber has been announced. The study of the chemicals used in this process — soluble arsenic, ammonium sulphamate, sulphamic acid, and sodium chlorate — was carried out by government chemists. The process is to be applied on a large scale.

Conversion

CANADA

Newsprint containing 5 percent to 15 percent of straw mixed with sulfite and groundwood has been experimentally produced by the Ontario Paper Co., Thorold, Ontario. The first experimental run amounted to approximately 50 tons. The process used was developed at the Peoria, Illinois, laboratory of the United States Department of Agriculture. The experiment disclosed that while use of straw as a substitute for wood pulp raised newsprint production costs, straw fiber could be used more advantageously in producing higher-grade papers, thus liberating wood supplies for newsprint manufacture. The finished product at Thorold appears to have much the same characteristics as paper made with the usual ingredients, groundwood and sulfite pulp. Strength was similar and the surface seemed even smoother than that of regular newsprint.

The straw was purchased from near-by farms in the stack and trucked to the mill's research laboratory. There it was chopped by ordinary ensilage cutters and cleaned of chaff. It was then placed in a large spherical steam cooker, and small amounts of sodium sulfite and soda ash were added. The mixture was cooked for two hours at a temperature of 170°C (340° Fahrenheit) and at a pressure of 7 kg per cm^2 (100 pounds a square inch). It was then decanted onto a screen over a pit and the chemicals were washed away with water. At this stage the straw still looked like straw, but its structure had been weakened. Delivered into a refiner, the straw was mixed with water and agitated so that the fibers were set free from the other plant structure. They then passed through screens that held back any fiber bundles that had not been separated. After passing through the screens the thick fluid was partly dehydrated to a semisolid mass. Bleaching powder was added to remove the yellowish color of the fibers, and the material was washed again to remove the bleach residues, which were now highly colored. The white liquid, somewhat thicker than cream, was mixed with groundwood and sulfite pulp and formed a sheet on the paper machine nearly 5 m (200 inches) wide, at the rate of 335 meters (1,100 feet) per minute. The proportion of the straw fiber was varied from 5 to 15 percent of the total. It is thought possible to increase the proportion to 25 percent.

FINLAND

The continuing rise in heating costs and the increased demand for economy in building have brought about in many countries a considerable expansion in the use of insulation boards. The raw material of insulation boards used so far has consisted mainly of wood fiber. However, another raw material, peat-moss, suitable for the manufacture of insulation boards, is available in Finland in unlimited quantities. For several years, experiments have been carried out aiming at the manufacture of peat-moss boards, and this spring the new Finnish peat-moss insulation board, called "Wisuboard," will be on the market for the first time. In addition to peat-moss, mineral oil bitumen is used as the second main component to remove the hygroscopic quality of the peat moss and to act as a binding agent. A special feature in its manufacture is that the bitumen used is dry-boiled into the peat-moss by a special method so that it forms a thin membrane around each individual fiber. This prevents the porous fibers from absorbing moisture and binds the board, making it firm and impermeable.

UNITED STATES OF AMERICA

One of the latest developments from research laboratories is a method of drying paper by sound with the "ultrasonic dryer." When the dryer is turned on, a rapidly rotating disk forces the air out through holes around its rim; this air is cut by vanes in another, turbine-like stationary disk. The pulses pass through acoustic horns, setting up tremendous sound vibrations which are applied to wet paper, agitating it and literally knocking off the water, considerably shortening what has always been a lengthy procedure. The soundmaker is also used in chimneys of paper mills to prevent the loss of certain chemicals hitherto dissipated during the paper-making process.

Utilization

SWITZERLAND

A concert hall made entirely of wood, 104 m. long by 62 m. wide and 16.50 m. high was constructed at Berne for the Swiss National Song Festival. The quantity of wood used was 700 m^3. The hall can hold 11,000 persons. Cost of erection was 1.4 million Swiss francs.

UNITED KINGDOM

The Timber Development Association has published a graph showing the construction of houses in England and Wales during the past 29 years. Figures for the year 1947 indicate that there has been an increase of 150 percent over 1946. The 127,900 houses constructed during 1947 in England and Wales required 204,000 standards of softwood, corresponding to an average of 1.6 standards per house. During the period 1934-36 an annual average of 330,000 houses were built, and 825,000 standards of wood were used, corresponding to 2.5 standards per house.

UNION OF SOVIET SOCIALIST REPUBLICS

Soviet Russia has been stressing the extraction of peat. According to Russian data, the country possesses 73 percent of the peat bogs of the world. Large-scale use of this material began only in 1924. It rose from 1.7 million tons in 1933 to 23.8 million tons in 1937. The present Five-Year Plan provides for the production of 44 million tons in 1950. Although in 1940 peat production was already more than four times greater than that of all other countries of the world together, it still is only a fraction of the potential production. According to Soviet experts, rational utilization of peat will serve primarily for electrification and industrialization. A considerable number of power stations are already burning peat. In 1940, 18.5 percent of the electric power in the U.S.S.R. was derived from the combustion of peat, particularly in the suburbs of Leningrad and Moscow, in Kalinin, in Smolensk, in White Russia — in all areas where wood is scarce. Power stations use from 60 to 80 percent of peat for fuel. It is certain that the peat industry has become increasingly important, both from the scientific and from the economic standpoint, and that it is only at the beginning of its development. Peat bogs cover vast areas; even under intensive exploitation, there is no risk of exhausting them for many decades. However, as exploitation expands, mechanical means of extraction will be required. Special hydraulic machinery has been designed for this purpose; several institutes for the study of peat are concerned with problems of drying and transportation. Peat is also used for the manufacture of insulation boards, as bedding for cattle, etc. When it is distilled, valuable chemical products such as phenol, creosote, tar and liquid fuels for tractors are produced from it.

UNITED STATES OF AMERICA

A revolutionary consumer-size peach package with a capacity of 11.7 liters (one-third of a bushel) will be tried out this year by the Benton Center Fruit Association, Benton Harbor, Michigan. Benton Harbor is in the heart of one of the largest peach-producing areas in the world. The boxes are 41.0 cm (16⅛ in.) long, 29.2 cm (11½ in.) wide, and 11.4 cm (4½ in.) deep. The ends are solid, 1.3 cm (½ in.) stock, while the sides are slatted and of 0.95 cm (⅜ in.)

stock. The boxes will be manufactured of ponderosa pine and local hardwood. The chief advantages claimed for the new package are that it holds a smaller amount than the conventional bushel basket (35.2 liters) and is therefore more convenient for the retail consumer, and that it permits the packing of riper, softer fruit because its slatted construction provides ventilation to permit rapid cooling of the fruit after it is packed.

Economics and Statistics

Austria

During the 1947 production period, according to recent figures, paper production appeared to be specializing according to occupation zones, with the American and British zones producing general types, and the Soviet zone turning out the bulk of roofing paper. Roofing paper production amounted to 444,000 m^2 per month during 1947, a sharp drop from the 713,000 m^2 reported monthly in 1946. Current monthly capacity is reported at 2,160,000 m^2. Monthly averages for other paper production in 1947 included 3,156 tons of newsprint; 3,439 tons of book and writing paper; 2,967 tons of wrapping paper; and 327 tons of special paper. The current monthly average of the paper industry is reported at 22,200 tons.

In March 1948 paper production, without roofing paper, amounted to 15,954 metric tons. In order to utilize fully the capacity of Austrian paper and cardboard plants some 2,000,000 m^3 (r) of pulpwood is required. This quantity is not yet available and the plants are working at 70 to 75 percent of capacity. However, this is a decided improvement. Paper and cardboard production for domestic consumption is about 100,000 tons per year, the balance being exported. Paper and cardboard hold a strong position in trade agreements between Austria and other countries, requiring domestic consumption to be curtailed. Austrian paper, for instance, is exported in exchange for German coal from the Ruhr. Through increased coal supplies, one big paper and fiber plant has increased its production of artificial fiber from 350 tons per month to 480 and is now working at full capacity. The supply of waste paper, however, is still insufficient. Normal yearly requirement is 45,000 tons but it was possible to collect only 13,900 tons in 1947 and 19,650 tons in 1946. This again is the consequence of the acute internal shortage, with every scrap of paper carefully kept and used again.

A joint Franco-Austrian Commission met in Vienna to conclude a further agreement on Austrian exportation of prefabricated houses to France. During the past two years, a large quantity of prefabricated houses was exported to France. They are considered to be of exceptionally high quality.

China

The paper and paperboard plants operated by the Chinese National Resources Commission produced 15,190 metric tons of paper and paperboard in 1947, compared with 4,992 tons in 1946. This represented an increase of 204.3 percent over 1946. The paper output of the NRC mills in 1947 was 153.6 percent greater than 1946. The NRC plants were reported to have manufactured about 20 percent of the paper produced in China during 1947. Pulp produced by these plants totaled 2,674 tons in 1947, none in 1946.

Czechoslovakia

Cutting and transportation plans were seriously hampered this year. Following the catastrophic summer drought of 1947, which killed a large number of spruce trees, there was very little snow during the winter, making it impossible to transport timber to the sawmills in time. In the eastern part of the country the rate of transportation was only a third of that planned. There was also a shortage of manpower and it was necessary to organize volunteer help. Lack of pitprops may curtail coal production.

Industrial production in 1947 and during the first months of 1948 exceeded expectations. However, the increased production depleted stocks of roundwood very considerably as compared to the year before. Figures for industrial production in 1947 were as follows:

Sawn timber — 2,965,000 m^3 (10 percent hardwoods) or 117 percent of the target figure

Railroad ties — 234,000 m^3 or 138 percent of the target figure

Veneer wood — 6,485,000 m^2 or 125 percent of the target figure

Plywood — 51,000 m^2 or 99 percent of the target figure

The value of wood exported in 1947 totaled 1,469 million Czech. korunas. Sawn timber came first with a total of 1,128 million Czech kcs. The principal importing countries were the Netherlands (307 million kcs.), Belgium (168 million), Italy (148 million), Egypt (145 million) and Palestine (115 million). Export value of finished products amounted to 703 million kcs., the major portion of which consisted of furniture (195 million); matches came second (82 million); veneer sheets and plywood came last (59 million). The export value of all wood products, which amounted to 2,172 million kcs., occupies fourth place on the list of Czechoslovakian exports, the total value of which was 28.6 billion kcs.

Czechoslovakia's 1947 production of paper and paperboard is reported at about 264,480 tons — approximately 80 percent of capacity, and only 10 to 15 percent below the prewar average. Newsprint makes up about 33,060 tons of this total, special paper 11,020 tons, graphic paper and wrapping paper, 110,200 tons for each type. Paper bags are produced at the rate of about 150 million annually. A variety of papers are now available for export, including writing, wrapping, and special fine-quality papers, cigarette papers, photographic paper, silk paper, various types of paper and cardboard boxes, books, games, paper flowers, and transparent paper. Production of all types of pulp has passed 70 percent of capacity, with an annual production of approximately 330,600 tons, about 20 to 25 percent below average prewar output. Mechanical pulp (production capacity estimated at 110,200 tons per year) comprises 88,160 tons of this total and sulphite chemical pulp 231,420 tons, of which domestic consumption amounts to about 165,300 tons. Sulphate pulp, being produced at twice the prewar rate, totals approximately 19,836 tons a year.

Finland

Fiberboard totaling 135,000 tons was manufactured in 1947, exceeding prewar production of 126,000 tons. This is one of the few industries having increased production beyond 1938 figures. The erection of a new hard fiberboard factory at Pihlova has been announced.

France

The annual amount of wood available in France, without adversely affecting the production capacity of its forests, is 7½ million m^3 of timber and 30 million steres of firewood and wood for chemical industries. During the past few years, however, the wood cut considerably exceeded these figures. France's forest industry produces, on an average annual basis, the amount of wood shown in the table below.

The total value of the annual production of the wood industry amounts to 50 billion French francs.

Forestry work, wood-cutting, and wood-processing provide employment for approximately 700,000 persons, 250,000 of whom are employed in felling, 60,000 in the sawmills, and 40,000 at other related work such as the collection of cork bark, extraction of resin, etc. Flooring factories, cabinetmakers, case factories, plywood factories, etc., employ 400,000 workers.

Indo-China

Development plans for forest production aim at an annual output, to be attained in ten years, of 1,550,000 m^3 of lumber. Of this amount, 350,000 m^3 would be hand sawn, 500,000 m^3 by portable saws at site, and 700,000 m^3 in nor-

Posts	125,000	steres or 500,000 posts
Mine props	2,750,000	m^3
Pulpwood	750,000	m^3
Industrial wood	75,000	steres
Wood for tanneries	500,000	steres
Firewood	15,000,000	steres
Charcoal	500,000	tons
Fuelwood[1]	500,000	tons
Railway ties	750,000	m^3 or 5,000,000 ties
Cask wood	100,000	m^3 or 25,000 m^3 cask and stave wood
Rough logs for sawing		
Sawn wood and wood for the manufacture of plywood	3,750,000	m^3
	350,000	m^3
Wood for cabinetmaking	300,000	m^3

[1]Wood used as fuel in gas-producing engines instead of charcoal.

mal sawmills—as against 875,000 m^3 in 1939, of which 700,000 m^3 were hand sawn. The target figure for woodfuel and charcoal has been fixed at 3,150,000 steres as against 1,900,000 and that of pine resin to 7,000 tons as against 890.

The measures proposed to achieve this purpose fall into three categories:

1. Expansion of the economically exploitable forest area by reducing logging costs through the use of mechanical equipment; reduction of transportation cost from forest to consumption centers; transportation facilities adapted to the use of mechanical equipment and processing in the forest.

2. Utilization of wood species hitherto neglected.

3. Long-term transformation of the composition of stands by appropriate silvicultural measures to favor economically valuable species.

Timber production is intended mainly to supply local demand, with a possible exportable surplus. Forest products such as charcoal and especially pine resin would find a ready export market. The target figure of 7,000 tons of raw resin, if processed, would produce almost 1,200 tons of turpentine and 5,000 tons of rosin, which is far in excess of anticipated needs for domestic consumption.

Iraq

Climatic conditions in northern Iraq are favorable to forest growth, but ruthless exploitation for firewood and the maintenance of large herds of goats have almost completely deforested the region, with the exception of rugged mountainous sections along the Turkish border. Some of the remaining stands could be utilized as pulpwood, but conservation and reforestation appear more important. Owing to the lack of water for industrial purposes, Iraq has no wood-pulp industry. All paper and related products must be imported. Consumption since the war has nearly trebled. The war gave the cigarette industry a tremendous impetus, and daily production has increased from about 2,500,000 cigarettes to 7,000,000. Of this output, some 6,000,000 are industrially produced, the others hand-made. Consumption of packing paper, cigarette paper, and paperboard increased correspondingly. Date exporters greatly improved packing methods during the past five years by using more paper and by extending the use of wrappers to the basket trade. Exporters also have made considerable improvement in the packaging of date cubes of various sizes, necessitating large quantities of cellophane paper. About 25 newspapers with a total daily circulation of 25,000 are published, as compared to the 10 newspapers with a daily circulation of 10,000 published 5 years ago. Import of paper and newsprint is government-controlled and the volume of trade with hard-currency countries is regulated by the amount of dollars available.

Italy

Negotiations between Sweden and Italy on payments and the exchange of commodities have been concluded in Stockholm. The new list for exports from Sweden contains the previously fixed quotas for viscose pulp and high alpha cellulose—85,000 and 3,000 tons respectively. The quota for paper cellulose has been increased from 20,000 to 33,000 tons and the quota for mechanical pulp from 3,500 to 7,500 tons; under certain conditions the quotas for paper pulp may be increased later.

Mexico

The Mexican paper industry operated at maximum capacity during 1947, working three eight-hour shifts daily and producing 105,728 metric tons of paper and paperboard. This was a considerable increase over the 1946 production of 95,443 tons. The 1948 output is estimated at 136,383 tons.

Mexico, with four plants, is one of six nations added to the list of rayon-producing nations in the past ten years. The other five are Colombia, with three new plants (one of which is reported suspended); Chile, with two plants; Cuba, Peru, and Egypt, with one each. Planning to enter the rayon industry in the near future are Australia, China, India, and the new nation of Israel, making a total of 35 countries as rayon producers. Many will be dependent to some measure on North American wood pulp, for which there is already considerable competition by the paper, rayon, and plastics industries.

Mexico's rayon output was 25,000 kg. (55,000 lbs.) in 1942; 250,000 kg. (550,000 lbs.) in 1946; 1,600,000 kg. (3,600,000 lbs.) in 1947. When its four plants are producing at capacity, output should exceed 4,500,000 kg. (10,000,000 lbs.). A greatly expanded rayon industry in Mexico will eventually import seven or eight thousand tons of high-alpha wood pulp from the United States or Canada and, perhaps, Sweden. This figure may even be exceeded. Two plants began operation in the past year and a third was expected to do so shortly. The new acetate rayon manufacturing plant of Celanesa Mexicana, S.A., at Ocotlan, in the state of Jalisco, about 80 km. (50 miles) east of Guadalajara, Mexico's second largest city, started about a year ago at the rate of 1.4 million kg. (three million lbs.) of yarn and is stepping up capacity rapidly to 2.7-3.2 million kg. (6 or 7 million lbs.) annually. Acetate for the Ocotlan plant is spun at the Cumberland, Maryland (U.S.A.), plant of Celanese Corporation and shipped to Ocotlan, but eventually it will treat cotton linters at its own plant. It will use 70 percent wood cellulose, all imported, and 30 percent linters pulp. Viscosa Mexicana, S.A., is another new celanese plant which will use the viscose process. This plant, at Zacapu, in the state of Michoacan, was scheduled to begin producing at the rate of 2.7 million kgs. (6 million lbs.) per year, but will eventually push production up to 4.5-5.4 million kgs. (10 or 12 million lbs.). The oldest of all the rayon plants in Mexico is Artisela Mexicana, S.A., in San Angel or Villa Obregon, a southern suburb of Mexico City. This is another viscose process plant, making about 450,000 kgs. 1,000,000 lbs. of rayon per year, but its production is being expanded. It was converted to rayon manufacturing in 1942.

Philippines

Exports of logs in 1947 totaled 8,870 m^3 1,958,000 board feet of which 8,220 m^3 1,817,000 went to the United States. Principal imports during 1947 were: lumber, 2,676 m^3 1,134,000 board feet); 86,000 railway ties; plywood 300,700 m^2 (3,327,000 square feet); newsprint, 17,526 metric tons; kraft wrapping paper, 1,345 tons; other printing paper, 1,330 tons; old newspapers for wrapping and packing, 8,934 tons; other wrapping paper, 2,060 tons; paper bags, 3,310 tons; wallboard, 14,430 tons.

Siam

According to its 1947 balance sheet, Siam's foreign trade has doubled its volume in comparison with the figures for 1946, with wood holding an important place among the exports. Nearly two-thirds of the wood exported was teak.

Sweden

An agreement has been reached as to the amount of wood pulp the wood-pulp industry will supply to Swedish paper mills. Deliveries in 1948 will amount to about 90,000 metric tons of chemical wood pulp and 14,500 tons of mechanical pulp—which is somewhat less than the amount allotted for domestic consumption the year before. This reduction is intended to make available a larger quantity for export. Domestic prices have been increased about 30 kroner per ton but still fall short of the general free-market price by about 250 kroner per metric ton. It is thought that Swedish wood-pulp exports to the United States during 1948 will be considerably lower than was expected. As a result of Swedish wood-pulp negotiations with Great Britain for the second half of 1948, the price for bleached wood pulp was increased by £1, and for unbleached sulphite wood pulp by 15 shillings. However, the price for unbleached kraft wood pulp remained unchanged. The increases were said to bring prices on the British market more in line with those prevailing in other countries. A trade agreement was concluded with the British and American Occupation Zones of Germany, and it is anticipated that 75,000 metric tons of wood pulp will be shipped there during 1948. During the first half of 1948 one-half of the amount had been contracted for and in part delivered.

Swedish paper production for 1947 is reported to have been 1,940,000 metric tons. This compares with 975,000 tons in 1946, and the normal yearly prewar output of 800,000 to 850,000 tons. Exports of Swedish pulp last year totaled approximately 1,735,000 metric tons, compared with 2,200,000 in 1937. Chemical pulp accounted for 1,510,000 tons of 1947 total, and the remainder was mechanical pulp. Stocks of chemical pulp were 172,000 tons at the end of January 1948.

A large plywood factory equipped with the most modern machinery is being erected for the Statens Skogsindustriers Company. It is expected that this factory will be able to export plywood to the value of 3 million Swedish kroner annually.

Switzerland

In a long public statement on the present-day wood economy of Switzerland, based on careful study of various phases of Swiss economic activity, particularly those dealing with the economics of forestry, the wood industry, and the building trades, Mr. Hess, Federal In-

spector-General of Forests, declared that it had become possible to remove the last wartime economic restrictions.

Union of South Africa

Artificially established exotic timber plantations in the Union of South Africa, an important part of the Union's assets, are valued at £23,000,000. It is estimated that, within the next 25 years, the investment in afforestation will be nearly doubled and the state is therefore vitally concerned with the economic use of plantation-grown timber. During the past ten or fifteen years the afforestation of conifers by private enterprise has advanced tremendously; private forests in the future will be a significant portion of the Union's plantations. Private enterprise is also vitally interested in organizing utilization of forest products. The Government, through the Division of Forestry, installed sawmills to work its own timber, and a Forest Products Institute was established to do research on utilization. During the war great encouragement was given to the local sawmilling industry, and at the same time the state sawmills were kept running. The local sawmilling industry, which was started by private enterprise, is almost wholly dependent upon the Department of Forestry for logs under short-term contracts.

The domestic sawmilling industry has labored under certain disadvantages: a great number of sawlogs were supplied from immature trees, the supply of sawlogs was very irregular, and transport conditions are uncertain compared to other countries. Many of these drawbacks are slowly disappearing and the products obtained from mature South African timber are equal in quality to the average imported product. As existing forests progress towards maturity, increasing and more regular supplies of sawlogs will become available. A revision of present methods of logging and transport is necessary to ensure that better log lengths are produced. The sawmilling industry developed very rapidly under emergency conditions and the demand was such that even poor products found a ready market. Fortunately, however, the larger private producers are fully aware that quality needs to be improved, and have gone far in the use of the best techniques of production. They are showing that the domestic product, if properly handled, can compare favorably with the imported product. Grading rules, sponsored by the South African Lumber Millers' and Shook Manufacturers' Association, will be issued shortly by the South African Bureau of Standards; they will do much to improve existing conditions.

United States of America

The United States Forest Service has accepted the bid of the Ketchikan Pulp & Paper Company (a subsidiary of the Puget Sound Pulp and Timber Company) to cut 42,480 thousand m^3 (1,500,000 thousand cubic feet) of pulp timber in the Tongass National Forest in southeastern Alaska. The stand consists of approximately 75 percent western hemlock and 25 percent Sitka spruce. The bid was the minimum set by the Forest Service: a stumpage rate of 30 cents a cubic meter (85c per 100 bd. ft.) for all timber used for the manufacture of pulp and somewhat higher rates for sawlogs and timber used for other purposes. The bid prices for the timber hold until 1 July 1962. At that date they will be subject to further determination and also every five years thereafter. The agreement extends to 30 June 2002. The purchaser is required to put up substantial bonds for performance of contract in accordance with detailed specifications regulating the cutting of timber, disposal of waste, fire prevention, and so forth. The Ketchikan Pulp and Paper Company is obligated to complete a 150-ton pulp mill within 3 years of the acceptance of its timber bid, and to achieve a capacity of 300 tons per day within 5 years. Permission is given to increase the mill capacity to 525 tons daily within 10 years. Before its bid was accepted, the company had acquired a millsite in Ward's Cove 9 km (6 miles) from Ketchikan, to which it is connected by highway and water.

The Forest Service does not set up any requirement as to the manufacture of paper, nor is there specification as to the kind of pulp to be made. It is the general understanding, however, that it will be sulphite.

A recent survey by the Experiment Station of the Northern Rocky Mountains at Missoula, Montana, shows that marketing conditions for wood have constantly favored the cutting of western white pine, *Pinus monticola*, and ponderosa pine, *Pinus ponderosa*, in their respective zones, as compared to other softwood species found in the same areas. The difference is so marked that the "index of commercialization," that is the average difference between the sales price of the products and the cost price at the sawmill (not including the stumpage rate), has been, between 1916 and 1945, far below 0 during 24 years out of 30 for the secondary species in the white pine region, and for 13 years out of 30, in the ponderosa pine region. During the same period, the index of commercialization fell below 0 only during the depression—for western white pine in 1933, and for ponderosa pine in 1931 and 1932. The development of uses and markets for the secondary species has considerably improved the situation. Nevertheless there is still a difference of more than $2.21 per cubic meter ($10 per 1,000 board feet) in favor of western white pine and from $1.10 to $1.77 ($5 to $8 in favor of ponderosa pine. The two species, however, represent only about one third of the trees in the stands of this region. The survey has clearly shown the importance of the problem of markets in the western United States, the need for conservation of ponderosa and western white pine stands, and the need to extend their areas.

Yugoslavia

Since the war all Yugoslav industries have been nationalized, including the timber industry, which is under the jurisdiction of the Ministry for Wood Industries; the ministry has several regional offices. The war caused a great deal of damage to factories and buildings, as well as to the forests. The Five-year Plan for 1947-51 provides for the rehabilitation of the wood industry and for better forest exploitation and sawmill production. It also provides for a considerable decrease in felling. For instance, only 18.5 million m^3 of timber will be cut in 1951 as compared to 27 million in 1939. The amount of wood intended for industrial use in 1951 is to be 8½ million m^3, as compared to 9½ million in 1939. The plan provides for the construction of plywood factories, paper mills, production of railroad ties, and the establishment of furniture manufacturing plants. It is hoped to produce 40,000 sets of furniture by 1951, part of which is intended for export. Implementation of the plan will considerably curtail exports of sawn and undressed timber.

Policy, Legislation, and Administration

Burma

The reorganization of the Burma Forest Service provides for three grades of officers: Selection grade, senior grade, and junior grade. Selection grade, which includes the Chief Conservator, the Conservators and the officers of the former Class I service, now comprises 37 officers against 80 before the war, while the Senior grade, which corresponds to the former Class II services, has 68 officers as against 82. This reorganization has

Procurement Program of the U. S. Economic Co-ordination Administration as Announced 15 August 1948

Date publicly announced	Commodity	Authorized to	Country of origin	Value
1948				
June 27	Wood pulp	United Kingdom	Canada and Newfoundland	$5,500,000
July 11	Newsprint	Bizone, Germany	Sweden	1,434,000
July 19	Wood pulp	France	Canada	371,000
July 19	Waste paper	France	United States	22,350
July 26	Groundwood pulp	Bizone, Germany	Sweden	888,000
July 26	Groundwood pulp	Bizone, Germany	Finland	488,000
Aug. 2	Waste paper	Bizone, Germany	United States	33,000
Aug. 2	Paper products	Bizone, Germany	Netherlands	300,000
Aug. 9	Electrical pressboard and tympan paper	France	United States	20,000
Aug. 9	Wood pulp	Greece	Sweden	170,000
Aug. 9	Newsprint	Greece	Sweden	210,000
Aug. 12	Mech. wood pulp	Bizone, Germany	Sweden	339,000
Aug. 12	Rayon grade wood pulp	Bizone, Germany	Sweden	2,210,000
Aug. 16	Bleached cotton linters	Bizone, Germany	United States	128,000
Aug. 16	Bleached cotton linters	Bizone, Germany	United Kingdom	128,000
Aug. 16	Pulpwood	Netherlands	Canada	140,000

diminished the number of officers; adminisrative duties, however, have increased. Twenty members of the Class II service were promoted to the selection grade to fill vacant positions and 20 rangers were raised to senior grade to fill their places. Four British foresters have been retained in the service with the title of adviser.

FRANCE

As a result of the fires which have swept through the Landes region in recent years, approximately four-tenths of the *Pinus pinaster* forests of this region, which are of great economic importance to France, must be re-established, often under more difficult conditions than for the original operation. The French Government has set up a special organization to work in close co-operation with local governments and private owners of the region. Many difficulties must be overcome, especially lack of manpower, the recurring need for soil improvement, and constant and efficient protection against fire. Large-scale plans, being mapped and carried out, will affect not only the conformation of the new forests but the entire agricultural structure of the region. Among the projects under discussion is one providing for the commercial cultivation of *Pinus pinaster* on a 75-year rotation. That would be just as long as the present rotation system, but for 50 years of that period the soil would be used as forest land, and for the remaining 25 years as cropland or pasture. A rotation which would diminish neither timber nor resin production would thus become possible, while at the same time fire protection measures will guard against a recurrence of catastrophic fires.

RUMANIA

Forestry legislation passed in 1947 provides for thorough protection of forest resources. The more important provisions include the following: All forest areas of more than 0.25 hectare are subject to the provisions of this legislation. All forests must be placed under proper forest management within the next four years; they are to be grouped by watersheds in the mountains and by economic units in the plains. Clear-cutting, with rare exceptions, is prohibited; forest ownership remains individual. Service in fire protection is compulsory, under penalties up to ten years of forced labor. All private forests are to be supervised by forest rangers. At least one graduate forester (forest engineer) must be employed for forests of more than 6,000 hectares and at least one subordinate forester must be employed for forests of more than 3,000 hectares.

UNITED KINGDOM

Application of the reforestation plan in the United Kingdom has resulted in a substantial increase in the number of workers employed in forestry work. Whereas, ten years ago the number of these workers was about 4,000, they now number about 10,000. In 50 years, when the plan is to have reached full development, it is expected that forest workers will number 50,000, not counting 200,000 others employed in wood industries.

These workers need homes. Although the problem can often be solved by building new houses in existing villages, the fact that the new forests are generally planted in sparsely populated districts often makes it necessary to establish new communities. A village of this type, near the new national forest of Ae, 16 km (10 miles) north of Dumfries, in the south of Scotland, is beginning to take shape. It will comprise 80 houses, with a school, shops, church, playing fields, and, naturally a sawmill.

The Forestry Commission began operations in this region in 1927, an area where sheep-farming had been predominant. Today, of a total of 4,323 ha (10,683 acres), more than 1,200 ha (3,000 acres) have been planted. A total of 3,200 ha (8,000 acres) will be forested, 100 ha (250 acres) will be reserved for agricultural purposes, and the remainder will constitute a summer range for sheep. When the first trees were planted only 16 men were employed. It is estimated that by 1960 there will be 90 men engaged in permanent work, excluding those needed for the sawmill, transportation, etc. Thus, the forest is restoring rural life to certain areas of the United Kingdom. However, the workers need not all be housed in villages. An allotment of a house, a garden, and a few acres of land will be given to those who prefer to rent forest holdings, with the guarantee of 150 days of work per year in the forest.

UNITED STATES OF AMERICA

A constitutional amendment to the laws of the state of Oregon will be submitted to a popular referendum in November. Its object is to enable the issuance of a loan based on 0.75 percent of the estimated value of the state domain for the rehabilitation of forests devastated by fire and for the development of forestry research. It is thought that this enabling act may produce a sum of more than $9,500,000 for these purposes. The total revenue derived from the sale of products obtained from State forests will be used to pay off the loan.

Meetings and Conventions

UNITED STATES OF AMERICA

The annual meeting of the SOCIETY OF AMERICAN FORESTERS will be held December 16-18 in Boston, Massachusetts. An attendance of 500 members and guests is anticipated.

According to Clyde Martin of Tacoma, Washington, president of the Society, the national meeting will open on December 16 with individual sessions of the Society's nine divisions having to do with private forestry, forest economics, forest recreation, forest products, forestry education, wildlife management, range management, silviculture, and public relations. Nonmembers interested in those fields of specialization are welcome to attend any of the sessions.

The fiftieth anniversary of professional forestry education in America, which began at Cornell University in 1898, will be observed at the general session on December 17 with addresses by well-known forestry educators.

At the final session on December 18, technical papers on forest practices in the Northeast will be given by representatives of federal and state governments and the forest products industries.

Personalities

After a tour of service with FAO, Alan Gordon has returned to Australia to resume his former duties with the Division of Forest Products, Council for Scientific and Industrial Research, in Melbourne. From its inception Mr. Gordon had been in charge of the work on mechanical wood technology in FAO's Division of Forestry and Forest Products. He will continue to help FAO as a member of the division's committee on Mechanical Wood Technology. On his return journey to Australia, Mr. Gordon visited several forest products laboratories in the United States and Canada.

Tor Sandbu has also left FAO after his year's tour of service, to resume his duties in the Norwegian Forest Service. Originally stationed in Washington, in the Forest Products Branch, Mr. Sandbu was transferred to the Division's European office at Geneva, where he assisted in the work of the European Timber Committee and in the preparation and publication of the FAO/ECE Quarterly Statistical Bulletin.

S. L. Frost of Bryan, Texas, acting director of the Texas Forest Service, has been named Executive Director of the American Forestry Association. Succeeding Ovid Butler, who retired in April, Mr. Frost, at 38, is the youngest executive officer in the association's 73-year-old history. Before his appointment this spring as acting state forester, he headed the educational work of the Texas Forest Service, serving at the same time as secretary of the Texas Forestry Association and, in 1947, as chairman of the Southern States Forestry Educational Directors Association. He also organized the wartime Civil Air Patrol of Texas forests.

Book Reviews

Road to Survival. William Vogt. Pp. 325. $4.00. William Sloan Associates, New York, 1948.

This book deals with the "relationships of man with his environment, that have powerfully shaped many of the dilemmas and quandaries of today and that, disregarded, will almost certainly smash our civilization." As readers of Mr. Vogt's earlier article in UNASYLVA, Vol. II, No. 1, would expect, the story is told vigorously, dramatically, forthrightly, and with brutal candor. Here is a powerful and comprehensive account of what man has done and is doing to himself, by continuing to damage or destroy his ultimate bases for survival—the land and its useful products.

The widespread and accumulative disruption of ecological balance has been brought about in many ways—through reckless cutting and burning of forests, through overgrazing and burning of ranges, through plowing of sloping lands, among others. Of vast effect is the belief and practice of using land for purposes to which it is not naturally fitted. Shifting cultivation, which clears forests from slopes for a short-lived agriculture, is still persistent and widespread. Such destructive and exploitative temporary uses have the effect of reducing the carrying capacity of land for man, and thereby increasing the environmental resistance of any unit of area to man. In a thinly-peopled habitat, lands damaged could be rested long enough to restore the soil. But in a world whose population has increased explosively during the past century, there are more and more countries in which time has run out; the maladjustment of man to his environment is already desperate, and prompt, heroic and drastic measures of conservation offer the only remedy. To the familiar examples of China and India, the author adds some of the lesser-known examples of equally critical countries of Latin America. Population growth, even and especially where the imbalance between growing numbers and shrinking resources is most severe, draws sharp attention. What is the reason for the continuance of practices which clearly are keeping in motion a descending spiral of self-extermination? The author seems to say that primarily the answer is wrong and selfish thinking about land as a source of exploitable wealth for individuals, rather than as the permanent source of real wealth for all. To the various groups which maintain this attitude the author offers hearty denunciation, and some fine invective.

Is there hope? Yes, though the way back to ecological health will be slow, hard, and costly. "The conservation program will have to rest on three legs: research, education, and action on the land. These must function simultaneously." The content and method of these programs is barely suggested, either in terms of national or of international action. There are nations which have measurably solved the problem of man and land, notably France, and their example, the details of their accomplishment, is the other side of the shield. Much havoc and ruin exist, but the world needs too the stimulus that effective, actual, national conservation programs can provide. It remains for another book to do as sound a job on the cure as the author has done on the diagnosis.

Foresters will find that the basic ideas and concepts by which they live underlie Mr. Vogt's thinking. Sustained yield, normal yield, carrying capacity, the protective values of forests in holding control of the environment, the sensitivity of natural types to drastic alteration, the stern reality of the basic biologic laws—some understanding of these is expected in the training of foresters, in particular the unity and indivisibility of land and its conservation. Neat, airtight compartments, labeled forest, range, or cropland almost surely lead to the trite but tragic situation of failing to see the woods for the trees. It is the author's hope that many other people, leaders, policymakers, legislators, educators, the people who exploit the land, and the people of cities who unknowingly depend on the land, will grasp such essential truths and see to it that they are applied while there is yet time.

This is, in short, a book with a mission —to arouse responsible people to thought, intelligent and knowledgeable recognition of a vast and urgent problem, and to effective action in their own self-interest.

Aerial Photographs in Forestry. Stephen H. Spurr. Pp. 327. $6.00. The Ronald Press Company, New York, 1948.

The author's stated aim is to bring together in one place existing information concerning the use of photographs in forest mapping, inventory, and other phases of forest management. Although the use of aerial photographs in forestry developed during the period between the two world wars, it is only during the last few years that the new technique of mapping and estimating timber has gained universal acceptance by the forestry profession in North America. Different types of aerial photographs are discussed, the kinds of films and filters which must be used to obtain pictures of the best types for forestry purposes, preferred seasons for photography, questions of scale and methods for actually taking photographs. Problems of aerial surveying and mapping from air photographs are then dealt with. The use of the stereoscope and of various instruments used when transferring planimetric and topographic data from photographs to the map are discussed in considerable detail. Techniques and principles of photointerpretation, and methods for the identification of various kinds of information of particular interest to foresters are outlined. Individual chapters deal with site, tree species, stand density and crown diameter, tree heights and areas.

The last part is concerned with forestry applications, including forest mapping and the estimation of timber volumes directly from photos, with discussion of the use of photographs and maps prepared from them for the control of forest inventory work on the ground.

Illustrations include many examples of different types of aerial photographs as well as illustrations of modern instruments and equipment. The book will serve as a valuable textbook for students of the subject, and contains much of interest to the experienced practitioner in this relatively new technique.

Forest Protection. Ralph C. Hawley and others. Pp. 355. $4.00. John Wiley and Sons, Inc., New York.

The second edition of this book, by Ralph C. Hawley, Morris K. Jesup, Professor of Silviculture, Yale University, and Paul W. Stickel, Assistant Professor of Forestry, University of Massachusetts, has just been published. It is a good standard textbook.

Soil and Water Conservation in the Punjab. R. Maclagan Gorrie, D.S.C., F.R.S.E., Indian Forest Service. Pp. 290. 7 s. 6 d. Published by the author, 1946.

This book, by an author whose previous works on the same subject are well-known, is more than a study confined to certain problems in such a region of India. It is an account of the different methods man has devised for the maximum use of and benefit from the water that falls on his land, and of the steps taken to repair the damage done by this same water in carrying away the soil itself. Though the author's experiences in the Punjab, where these problems, together with that of wind erosion, are vital, furnish the principal sources of his information, he has also drawn largely from American literature on this subject, as well as from experience gathered during study tours in the United States.

After a brief account of the general characteristics of erosion and a summary classification of methods of control, the first chapters of the book are devoted to describing contour culture and terracing, to the application of these methods to wooded and pastoral lands, and to the management of pasture lands to protect them from erosion. A remarkable chapter follows in which the author studies the natural cycle of the evolution of water in the soil, in the air, and on the ground surface, giving particular attention to snow. There is a short clear chapter with useful information on costs, material on modern mechanical equipment for work in restoring the soil, and a detailed study of different methods, useful in arid regions, of obtaining the maximum efficacity from water, either by storing it or by turning it from its natural course for the purposes of irrigation.

In the first pages the reader is disappointed that the author does not take a firmer stand on the priority that should be accorded to works of restoration and stabilization of the upper reaches of streams. In the mountainous regions of Europe, such as Switzerland, Italy, Austria, and France, where that question is often pressing, opinion is almost unanimous that works undertaken in the lower reaches of torrents and rivers, because of the necessity of protecting highways, railroads, communities, or large cultivated areas, are a waste of money as long as the cause is not controlled at its source, in the watersheds.

However, in the final chapter, which

he has aptly titled "Co-ordination," and which is really the key to the whole book, Mr. Gorrie corrects this impression and fits all the elements of the book into their proper perspective. He advocates logical plans based on detailed and accurate knowledge, assuring the co-ordination of all efforts which tend to conserve these two essential resources of man—soil and water—which so often work in opposition to each other. It is essential to make basic plans for complete drainage area. This would be difficult to accomplish in countries that have both a dense population and an advanced civilization, circumstances which without doubt would necessitate that plans of this nature be limited to smaller reservoirs, tributary or sub-tributary to major valleys. But this again is difficult to realize when these major valleys lie astride several countries, and here international organizations have perhaps a role to play, as the author remarks in alluding to the FAO. Nevertheless the principle that he advocates is undoubtedly sound and the only one by which any advance can be made in the vital problems treated in this book.

Circumstances have obliged foresters in India to become directly interested in these problems, and even in many cases to become the working core of pastoral and agricultural as well as of silvicultural rehabilitation, but many forestry technicians in other regions and countries still fail to recognize the role of forests in the general economy. At a time when the development of tropical countries and the economic transformations of other countries are accentuating the importance of studying land utilization, it is essential that foresters become aware of this and do not allow themselves to be limited by the boundaries of their forests.

Instability of Forest Land Ownership in Western Oregon and Washington, 1932-41. Sinclair A. Wilson and Paul E. Malone. Pacific Northwest Forest and Range Experiment Station, Portland, Oregon.

Good forest management by private forest owners is greatly affected, among other things, by continuity of ownership. In this report the authors document the reversion of private forest land to public ownership through failure to pay taxes, especially in the 1930's, in an important forest region of the United States. Among the factors analyzed by the investigators as having an important bearing on instability of ownership during the economic depression in the periods up to World War II and after 1941 are (a) intent of ownership (including an analysis of the Tree-Farm campaign); (b) lack of conservative cutting; (c) fire and fire hazard; (d) smallness of holding (more unstable in holdings under 2,000 ha. (5,000 acres); (e) degree of industrial development (large-scale development came after 1940); (f) overassessment for taxes (the principal cause); (g) unduly heavy tax-load to support local government services; (h) differences between state and county government financing; (i) faulty collection practices.

Action proposed includes more and better land-use planning, improvement in cutting practice, more effective fire control, reduction of waste, simplification of local government structure, modification of local revenue systems, better administration of property tax, development of forest credit facilities, provision for insurance of standing timber, and extension of technical aid by government to woodland owners and operators.

Annual Report for 1947 of the Pacific Forest and Range Experiment Station. U. S. Department of Agriculture, Forest Service.

Against a background of the status of forest management in the states of Oregon and Washington, the work and accomplishments of the Experiment Station are so outlined as to emphasize their potential contribution to the improvement of forest industries and the proper management of forests, range land, and watersheds. In a region containing considerable areas of virgin timber in need of access roads, there are also outstanding examples of wood-using centers where the sawmill capacity has been greatly in excess of not only the timber growth but of the accessible volume. In the words of the report "the timber account of western Washington and northwest Oregon has been overdrawn for years. This overdraft is now being partially replaced by overdrawing southwest Oregon. ... [It is alarming to note] the migratory and transitory nature of a large part of the presently installed mill capacity."

The increase in the number of consulting foresters and of foresters in the employ of private companies is heartening, and it is to be hoped that "this movement toward good management will survive beyond the present high levels of prosperity in forest industries." As an aid in this direction, the station has carried on studies which showed the importance of stability of ownership of forest land and financial stability in utilization operations as well as timber management policies to promote the permanence of integrated utilization enterprises.

Considerable emphasis has been placed on studies of: cost of truck and trailer hauling of logs; kiln-dried lumber; shipping containers for fruit; the expansion of the softwood plywood industry through the use of veneer from low-grade logs; the development of a cut-stock industry based on salvage of mill waste; the fabrication of wood products of glued-laminated construction; the use of local hardwoods for pulp, lumber and veneer stock; the expanded use of sawmill waste, logging waste, and second-growth thinnings for pulp; the utilization of so-called waste wood for insulated and hardboard plant; the production of alcohol, molasses, and yeast from wood waste; and the testing of wood molasses and yeast for stock feeding at Agricultural Experiment Stations in Washington and Oregon.

The forest survey is continuing with its gathering of statistical information needed by the wood-using industries.

Forest-management research continues on partial cutting in old-growth Douglas fir, management of second-growth Douglas fir, and silviculture of ponderosa pine. A new line of work in this field aimed at translating small-plot results into practical woods operation has been set up to test silvicultural, mensurational, fire, and economic study results on commercial-sized logging operations. This work has been carried out in four experimental forests, and arrangements have been completed for two additional centers for this type of study demonstration.

Notre Forêt (Our Forest). Frank Aubert and Robert-Ch. Gut. Pp. 156. 6 Swiss francs. La Librairie Payot, Lausanne, Switzerland.

In this condensed treatise on basic forestry, the authors give a brief historical survey of the relations of mankind to forests and outline the effects of forests upon climatic and economic conditions, the principles of tree cultivation, the basic elements of forest protection, management, and exploitation. One chapter is devoted to forest technology, but the chapters on forest policies and trade associations deserve special attention. In the former, the authors try to show what methods are best suited to Switzerland for rational forest management, economic development of production, rational and full utilization of all products obtained from the forest. The noteworthy part played by the Swiss Forest Economy Association is also indicated. The brief chapter on the trade associations refers to the Swiss co-operative movement, with regret that this movement has not yet found its place in the country's forest economy. The authors believe that the near future will inevitably bring about the setting up of co-operatives, grouping forest owners, technical and administrative staffs, forest laborers, and transportation and factory workers in forest enterprises, and they believe that these co-operatives will exert a powerful influence for the protection of Swiss forests.

Tree Management and Marking Rules—Second-Growth Douglas Fir. William A. Tinney and Donald B. Malmberg.

The conclusions the authors have reached and published under the auspices of the College of Forestry, University of Washington, and the Skagit Forest Council are based on research made in ten separate experimental plots scattered over Snohomish and Skagit counties in the state of Washington. The rules applied to thinning these growths deserve particular attention from a practical standpoint. It is obvious that, with the rapid exhaustion of the virgin stands of Douglas firs, the industries of the western United States must rely more and more on second-growth stands. Numerous farm-woodlands, which are often situated on excellent soil, have very rich stands of this type. Owners and foresters in charge of larger areas will benefit from the clear directions given in this book.

THE Nations accepting this Constitution, being determined to promote the common welfare by furthering separate and collective action on their part for the purposes of

raising levels of nutrition and standards of living of the peoples under their respective jurisdictions,

securing improvements in the efficiency of the production and distribution of all food and agricultural products,

bettering the condition of rural populations,

and thus contributing toward an expanding world economy,

hereby establish the Food and Agriculture Organization of the United Nations . . . through which the Members will report to one another on the measures taken and the progress achieved in the fields of action set forth above.

—Preamble to the Constitution of the Food and Agriculture Organization of the United Nations

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